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UNIVERSITY OF KANSAS PUBLICATIONS  
MUSEUM OF NATURAL HISTORY

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Volume 14, No. 14, pp. 165-362, 2 figs.

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May 20, 1963

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## The Mammals of Veracruz

BY

E. RAYMOND HALL AND WALTER W. DALQUEST

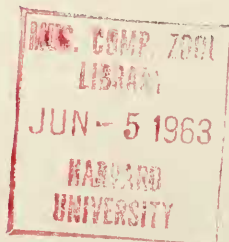
UNIVERSITY OF KANSAS  
LAWRENCE  
1963

UNIVERSITY OF KANSAS PUBLICATIONS, MUSEUM OF NATURAL HISTORY

Editors: E. Raymond Hall, Chairman, Henry S. Fitch,  
Theodore H. Eaton, Jr.

Volume 14, No. 14, pp. 165-362, 2 figs.  
Published May 20, 1963

UNIVERSITY OF KANSAS  
Lawrence, Kansas



PRINTED BY  
JEAN M. NEIBARGER, STATE PRINTER  
TOPEKA, KANSAS

1963



29-4035



# The Mammals of Veracruz

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## INTRODUCTION

In the rich, tropical lowlands of Veracruz, mammals have long interested man. Several species had religious and ornamental significance. Statues and ornaments of clay and stone representing mammals are common. Four stone squirrel heads in the plaza at San Andrés Tuxtla weigh more than a hundred pounds each. The importance of hunting to the Indians before the Conquest is not known. They had few domestic animals and no draft animals. The Indians were a civilized, agricultural people; corn was a principal food crop.

The accounts of the Conquest, although well documented in many respects, provide relatively little information on the native wildlife. In one letter to Charles V, Cortés on July 10, 1519 (see pp. 20-21 of translation by J. B. Morris, 1928), mentioned that "All kinds of hunting is to be met with in this land and both birds and beasts similar to those we have in Spain, such as deer, both red and fallow, wolves, foxes, partridges, pigeons, turtle doves of several kinds, quails, hares and rabbits: so that in the matter of birds and beasts there is no great difference between this land and Spain, but there are in addition lions and tigers about five miles inland, of which more are to be found in some districts than in others." The situation is not greatly different today!

The colonial period was marked by the introduction of livestock (cattle, horses, burrows, sheep, swine, goats) and food plants (beans, sugar cane, rice). The impact of these introduced species on the native wildlife must have been great.

In the post-colonial period wildlife probably was affected by firearms becoming available to large numbers of persons. The Diaz period, in Veracruz, was marked by intensive exploitation of large parts of northern and southern Veracruz by foreign interests, especially British and American. The foreigners were far more effective in exterminating wildlife than was the native population.

In the modern period, since 1910, firearms and ammunition have been available to a large part of the population. New roads are constantly being constructed into previously inaccessible areas. Enforcement of game laws is difficult. Over large areas the larger mammals have been eliminated, and their extirpation at an accelerated rate in other areas seems inevitable.

Local names applied to mammals of Veracruz can be divided into three categories. The first category consists of Spanish names applied to mammals that closely resemble species in Spain, for example zorra (fox), ardilla (squirrel) and conejo (rabbit). The second category is made up of descriptive phrases in Spanish for animals that do not closely resemble any in Spain. Examples are cabeza de viejo (the tayra, a white-headed mustelid) and brazo fuerte (literally strong arm, referring to the tamandua—an anteater). The third category consists of names only slightly changed from the Indian (usually Nahuatl) language. Examples are coyote from the Nahuatl coyotl and mapache from the Nahuatl mapachtli.

In general, local names, distinctive of genera and often of species, are available for the mammals except kinds of bats, mice, and rats. All bats except the vampire are designated by the Spanish "murciélago." The vampire is "vampiro." Rat is "rata" and mouse is "ratón."

In 1947 and 1948 Walter W. Dalquest drafted an account, much more extensive than the present one, of the mammals of Veracruz. In the period 1959-1961 E. Raymond Hall modified the account into essentially its present form. In the latter period Bradford House and Ticul Alvarez re-examined the specimens, prepared new lists of "Specimens examined," and checked the specific and subspecific identifications. Hall and Alvarez studied the specimens from northern Veracruz obtained in 1960 by M. Raymond Lee and in 1961 by Percy L. Clifton and J. H. Bodley and incorporated the

resulting information in the manuscript. In the itinerary and accounts of species the pronouns I, me, my, and mine refer to Dalquest. In the remarks on habits of the different species the quoted material that is not identified as from some previously published source is from Dalquest's field notebooks on file in the Museum of Natural History at the University of Kansas at Lawrence.

Mammals were collected in Veracruz for the Museum of Natural History principally to obtain topotypes and other specimens from there that would enable investigators at the Museum to have comparative materials for studying speciation and subspeciation in mammals from adjoining areas. Aims of the following account are to make known (1) the kinds of native mammals of Veracruz, and (2) the geographic distribution of each kind in Veracruz; and (3) to record natural history information as given beyond because such information is scarce or lacking for many of the species.

Presentation at this time of the results of study of the taxonomy and the geographic distribution of the mammals of Veracruz is timely because corresponding information is being organized by other authors for the mammals of Tamaulipas to the northward and for those of Tabasco to the southward. Also, the combined information from these three accounts will aid in investigations underway in Yucatán and adjoining areas.

For any technical (scientific) name of a species or subspecies beyond that differs from that in "The Mammals of North America" by Hall and Kelson (1959), an explanation or citation to an explanation immediately follows the listing of records of occurrence. Where no such citations are given, basis for a name can be found in the mentioned publication by Hall and Kelson.

For kinds of mammals known to occur in Veracruz, previously published information is cited in the accounts beyond (1) if the information relates to kinds found by other investigators but not by us, and (2) if specimens are listed from places additional to those from which the University of Kansas Museum of Natural History has specimens. Also, some previously unrecorded specimens in other museums are here recorded for the first time.

For the use of these specimens and for other assistance we thank David H. Johnson, Henry W. Setzer and Charles O. Handley, Jr., of the U. S. National Museum; Richard H. Manville, Viola S. Schantz, and John E. Paradiso, of the mammal collections of the U. S. Fish and Wildlife Service; Philip Hershkovitz and Karl F. Koopman of the Chicago Natural History Museum; and G. B. Corbet of the British Museum, Natural History. Some of the re-

search in the laboratory was supported by Grant No. 56 G 103 from the National Science Foundation. Field work was supported by a grant from the American Heart Association, Inc., for a brief period by a grant from the Atomic Energy Commission, and principally by grants from the Kansas University Endowment Association.

### LIFE-ZONES

Life-zones, from the Arctic-Alpine to the Tropical, are present in Veracruz. The physiography of the state is such, however, that the higher life-zones are all in a small area along the western edge of the central part of the state. There the eastern edge of the Mexican Plateau extends eastward into Veracruz, and the desert-inhabiting mammals of the Lower Sonoran Life-zone enter the state. At the eastern edge of the plateau in Veracruz, the land rises abruptly, and the top of the great volcanic cone of the Pico de Orizaba is 18,077 feet above sea level. Orizaba is the second highest mountain in North America, being exceeded only by Mount McKinley in Alaska. On the eastern side of Mt. Orizaba, and its neighboring mountain, Cofre de Perote, the land pitches down abruptly. The summit of Orizaba is only 70 miles from the Gulf of Mexico and the distance from its summit to the Tropical Life-zones at the city of Orizaba is only 18 miles.

The upper life-zones, in Veracruz, are present in only a small area. Much of this area is made up of the Lower Sonoran Life-zone, the desert of the Mexican Plateau, and even this zone is but faintly represented on the eastern slope of the Plateau. Above the Lower Sonoran Life-zone, it is difficult or impossible to delimit the individual life-zones customarily recognized farther northward; instead there is the area of pines, then the zacaton and firs, and finally the area above timberline which can be designated as the Arctic Alpine Life-zone.

The remainder, approximately 95 per cent of the state, lies in the Tropical Zone. For practical purposes we choose not to attempt to recognize an Upper Tropical Life-zone and a Lower Tropical Life-zone, but instead prefer to recognize three divisions of the Tropical Zone. The divisions are arid, lower humid, and upper humid.

The Arctic-Alpine Life-zone in Veracruz includes the peak of Mount Orizaba. Probably this life-zone normally has no distinctive mammalian fauna at this latitude.

The other boreal and temperate life-zones form a narrow belt round the upper parts of the slopes of the Cofre de Perote and

the Pico de Orizaba, from near Tlapacoyan, on the north, to near Acultzingo, on the south. This belt is characterized by coniferous trees and a distinct mammalian fauna. Characteristic species, in Veracruz, are: *Sorex macrodon*, *Sorex saussurei*, *Cratogeomys perotensis*, *Reithrodontomys chrysopsis*, *Sciurus oculatus*, and *Neotomodon alstoni*. The parts of this belt at higher levels are more humid, and the species of conifers differ from those of the lower levels. The higher areas have numerous meadows of a bunchgrass (zacaton). Only a few kinds of mammals are restricted to the upper area; only the volcano mouse (*Neotomodon*) and the volcano harvest mouse (*Reithrodontomys chrysopsis*) seem to be confined to it.

The Mexican Plateau, intruding from the west brings the Sonoran life-zones into the area to the north and west of Cofre de Perote. This is an area of sandy desert, supporting mammals characteristic of the Sonoran life-zones: *Cratogeomys fulvescens*, *Dipodomys phillipsi*, *Perognathus flavus*, *Spermophilus perotensis*, and *Peromyscus difficilis*.

On the eastern slope, the Sonoran life-zones are almost pinched out, owing to the rapid drop of the terrain. There is an indication of the Sonoran zones near Las Vigas, and again in the valley below Acultzingo.

At the northern edge of the temperate area, near Tlapacoyan, there is an abrupt transition from the temperate area to the Tropical Zone. At Teziutlan in the state of Puebla there are extensive forests of conifers. Going eastward, and downward, a person passes through an area strongly reminiscent of the humid division of the Transition Life-zone of the northern Pacific Coast of the United States. Beneath broad-leaved trees of the alder type, a dense growth of mosses and sword ferns cover the ground. Continuing eastward, there is a gradual transition; the sword ferns give way to tree ferns, the alderlike trees give way to tropical trees, the stream courses have a distinct tropical flora, and finally the temperate forms of vegetation are found only on the higher hills, before disappearing completely in favor of a pure tropical forest.

At the southern edge of the temperate area, near Acultzingo, the conifers of the northern temperate area, the western desert flora, and the eastern tropical flora almost meet at an area of brushland. The entire area is somewhat humid, being cloud-covered much of the time as a result of the warm winds, which blow in from the gulf, rising and spilling over the lip of the plateau near Acultzingo. Nevertheless, the water runs off rapidly because the



area is rocky and slopes steeply. The area of brushland has scattered coniferous trees in sheltered places. The trees support an extremely rich flora of bromeliads, mosses, ferns and orchids, although the ground beneath is relatively dry. The mammalian fauna is limited as to species and numbers of individuals, but is made up of species from the temperate zone, the desert, and the tropical jungles to the east. According to Dr. Edward H. Taylor of The University of Kansas, the area has a rich endemic fauna of reptiles and amphibians.

In Veracruz the arid division of the tropical zone is best seen on the coastal plain, which is relatively level, extending from sea level along the gulf to between 700 and 1700 feet, depending on the topography. Much of the plain is grassland that, by the later part of the dry season, is sparse, dead and brown. The earth is baked and cracked. Vegetation consists of scattered, bushlike trees with lacy foliage and thickets of flat-topped, thorny bushes. But along the water courses the jungle is thick and dense. There the trees are tall and abundantly hung with vines, parasites and epiphytes. The mammalian fauna of this division includes some species that are not found in other divisions of the Tropical Life-zone. Examples are *Reithrodontomys fulvescens*, *Sigmodon hispidus*, and *Liomys pictus*. Several species have subspecies in the arid division different from those in the upper humid division of the tropical zone.

The upper humid division of the tropical zone is the dense forest area, where the trees are tall and abundantly hung with many species of vines, mosses, ferns, cacti, bromeliads, orchids, and other parasites and epiphytes. This division has a distinct fauna. The mammals include several species that, in Veracruz, seem to be confined to it. These include: *Cryptotis mexicanus* and *Microtus quasiater*.

The line of contact between the upper humid and arid divisions of the tropical zone is sharp; in places, one can tell almost to the yard where the two meet. This arrangement has resulted from human activities. Originally, a band of oak forest separated the upper humid division and arid division of the tropical zone. This oak forest was transitional in nature, being neither strictly semi-arid nor semihumid. Unfortunately the land most important for cultivation is at the junction of these two. There the land is level, and cultivation is practical; also this zone is the most humid part of the relatively arid coastal plain. As a result the land was cleared

for cultivation and numerous towns and villages are situated there. A second factor that makes for rapid clearing is the oak itself. This wood makes a superior kind of charcoal. The trees grow on relatively level ground and therefore the charcoal made from them is easily transported to market. Consequently the oak forest has completely disappeared in most places. Only in the more inaccessible areas is there any extensive oak forest remaining. In so far as we were able to determine, the oak forest has no kinds of mammals endemic to it; those trapped were kinds which occurred also on the coastal plain and individuals were few.

The lower humid division of the tropical zone includes the dense, lowland jungle, and in most respects does not differ greatly from the upper humid division, but in detail it differs greatly. Many species of trees are confined to the lower humid division, as also are several species of mammals, for example *Alouatta villosa*, *Tapirus bairdii*, *Cyclopes didactylus* and *Tayassu pecari*.

The topography of Veracruz, except for the mountains and the edge of the Mexican Plateau already discussed, is relatively simple. The state is a low, level, tropical lowland, extending northward and westward between the Gulf of Mexico and the high, arid desert of the Mexican Plateau. The tropical part of the state has but two important topographic interruptions. One is the Tuxtla Mountains. They are a group of small volcanic peaks and basaltic intrusions. Although the peaks are not high, the highest, Volcán San Martín Tuxtla, being only 5000 feet above sea level, the area is much elevated above the surrounding plain. The area is an island, of the upper humid division of the tropical zone, completely surrounded by the lower humid division of the tropical zone less than 100 feet above sea level. The mammalian fauna of the Tuxtla Mountains has not been thoroughly studied, but the study which has been made reveals a certain amount of endemism among the mammals.

The second interruption of the coastal plain is the arm of high country which extends eastward along the twentieth parallel almost to the waters of the Gulf. There the lowlands average less than 10 kilometers wide for a distance of approximately 45 kilometers in a north to south direction along the coast. The high land that extends eastward to the coast seems to have served as a barrier to the dispersal of the spiny pocket mice since only *Liomys pictus* occurs to the southward and *Liomys irroratus* to the northward. For the most part, however, the barrier serves only to divide the ranges of subspecies.

## ITINERARY

In the first season of field work in Veracruz by Dalquest he was accompanied by his wife, Peggy. On February 9, 1946, they traveled via Tlacotepec and Tehuacan in the state of Puebla to Potrero in the state of Veracruz. Potrero is the site of Ingenio El Potrero, a large sugar mill and sugar cane plantation. Mr. Dyfrig Forbes, the superintendent of Ingenio El Potrero, and his wife, Mrs. Leora Forbes, welcomed the Dalquests and invited them to make the beautiful Hacienda Potrero Viejo the base of their operations in Veracruz. Potrero Viejo is an old Spanish colonial village situated seven kilometers west of Potrero. Potrero Viejo, rather than the modern Potrero, is the "Potrero" of Sumichrast.

Several days were spent at Potrero Viejo. Trips were made to nearby caves where bats of several species were found. On February 15 camp was established on the north side of the Río Atoyac, approximately eight kilometers northwest of Potrero Viejo. There a local man named Valdo (killed in 1947) and two of Mr. Forbes' employees, Casildo Mazza and his nephew, Gerardo Mazza, assisted in the collecting of specimens. Work was continued in the vicinity of Potrero until March 24, except for a short trip on March 17 and 18, with Mr. Forbes, to the coastal plain near Piedras Negras.

On March 24 camp was moved to the Río Metlác, four kilometers west-northwest of the town of Fortín. Mr. Daniel Rabago, manager of the power plant of the Moctezuma Brewery, made available a splendid camp site, modern conveniences, and some of his employees as assistants. On April 8 the Dalquests returned to Potrero Viejo.

Further information, condensed from the field notes of W. W. Dalquest, is as follows: On April 10, we drove to Mexico City and then made a leisurely trip to the international border, collecting specimens at various localities along the way. On April 24 we shipped our specimens from Laredo, Texas, and on April 29 again started southward, reaching Potrero Viejo on May 5. There equipment and supplies were packed, and on May 9 we left for the coastal plain where we set up and maintained our camp on the Río Blanco 20 kilometers west-northwest of Piedras Negras. Gerardo Mazza again served as our assistant and camp was established on land belonging to his father. Except for one trip (May 20-23) to Cordoba and Potrero Viejo for supplies, we remained near Piedras Negras until May 31. The rainy season had begun by that time, and we had some difficulty in crossing the swollen Río Blanco and the muddy coastal plain. We remained at Potrero Viejo until June 6, then collected in central and northern México, and crossed the international boundary at Laredo on July 4.

The second season's work was begun on September 8, 1946, when I (W. W. Dalquest) and Allen Oleson of Boulder, Colorado, crossed the border at Laredo. Collections were made along the highway, and we did not arrive at Potrero Viejo until the afternoon of September 23. In the period September 26-28 we camped on the edge of an arroyo 15 kilometers east-southeast of San Juan de la Punta. The period September 28 to October 7 was spent on the Río Blanco, 20 kilometers west of Piedras Negras. Gerardo Mazza then was engaged and acted as assistant for the year. On October 7 we returned to Potrero Viejo, but left on October 9 and for one night camped 15 kilometers east-southeast of San Juan de la Punta, and then for two nights camped five kilometers southwest of Boca del Río, on the lower reaches of



the Río Atoyac, near its mouth. On October 13 we drove through the city of Veracruz to Jalapa, and camped five kilometers north of that city. We remained until October 20. On October 20 we camped three kilometers west of Plan del Río and from the afternoon of October 21 until October 23 at Puente Nacional. On the 23rd we returned to Potrero Viejo and on October 24 we made a round trip to Cordoba. We left Potrero Viejo on October 21, camped on the beach at Mocambo on the night of the 28th, drove to Veracruz on the 29th, on to Puente Nacional and Jalapa to two kilometers west of Jico where we camped until October 31 (Oleson set traps on the evening of the 27th five kilometers north of Jalapa). On the 31st we drove back to Jalapa and eastward to where we camped three kilometers east of Las Vigas until November 5. From November 6 until November 9, we collected on the desert two kilometers east of Perote. From November 9 until 11 we camped and collected six kilometers south-southeast of Altotonga and on the 11th we drove *via* Tezuitlan, Puebla, to an overnight dry camp seven kilometers southeast of Jalacingo. On November 12 we drove high on the slopes of the Cofre de Perote, and camped at 10,550 feet elevation, 11 kilometers northwest of Pescados. Although it was bitterly cold, we remained in this camp on the Cofre de Perote until November 18 when we drove *via* a place designated as two kilometers south of Sierra de Agua, 8500 feet, to the desert, where we camped for one night three kilometers west of Limón, placing us one kilometer east of the border of Puebla. The next day we drove to the highway to Puebla, and then east, camping on the night of November 19 three kilometers west of Acultzingo, and reached Potrero next day, when Mr. Oleson left to return to the United States.

We (Gerardo Mazza and Dalquest) left Potrero Viejo on November 29, and managed to drive southward along the Tehuantepec railway and then south to where we camped three kilometers north of Presidio until December 4 when we moved camp to a point two kilometers north of Motzorongo, where we remained until December 11. On December 11 we returned to our earlier camp three kilometers north of Presidio, and worked there until returning to Potrero Viejo on December 13. On December 14 we made an overnight trip to a camp seven kilometers southeast of San Juan de la Punta. We returned on the 15th to Potrero Viejo and left there on December 17, drove *via* Cordoba to Orizaba, and camped three kilometers southeast of Orizaba until December 22 when we returned to Potrero Viejo.

On January 12, 1947, Gerardo Mazza left for the Río Blanco, to collect alone, and I left Potrero Viejo to go to the state of Tabasco. An illness contracted in Tabasco prevented field work for some days, and it was not until February 1 that Mazza and I together took the plane for Coatzacoalcos. We collected at places 14 kilometers southwest of Coatzacoalcos, at a place seven kilometers northwest of Paso Nuevo, and at a place 10 kilometers northwest of Minatitlan until February 12, when we took the plane for Cordoba. Unfortunately, weather conditions prevented the plane from landing in Veracruz, and we were taken to Mexico City. We were forced to live in Mexico City until money for our fare back to Potrero could be sent from there. We did not leave for the field again until February 26, and this time we went by train to Jimba where we remained until March 6 except for a side trip on March 4 and 5 to a place 15 kilometers to the southwest. We returned *via* Cordoba to Potrero Viejo leaving again for Cordoba on March 10, and

from there on March 11, by train for Jesús Carranza (old name Santa Lucrecia) on the Isthmus of Tehuantepec. After several days spent near Jesús Carranza, we obtained passage on a dugout canoe, and lived with the Indians downstream from Jesús Carranza for more than a week. On March 23 we returned to Potrero Viejo. We made a short trip, March 31-April 2, to Cosamolapán, and then packed our materials and specimens. Mazza then returned to the Río Blanco while I left for the United States, crossing the international boundary on April 27.

In the third season, I (Dalquest) drove directly from Lawrence, Kansas, to Potrero Viejo, arriving on September 21, 1947. A local boy, having the given name of "Moises," there was engaged as assistant. Camp was established two kilometers north of Paraje Nuevo, a few kilometers from Potrero Viejo, on September 23, and collecting was done there until September 28. On September 28 we left for our old camp on Boca del Río, but stayed there only one night and collected specimens three kilometers west of Boca del Río before returning to Potrero Viejo. On October 6, we drove to the edge of the plateau and camped three kilometers west of Aculzingo where we remained until October 8, when we drove to Limón, on the Perote desert, and camped three kilometers west of the town until October 11. On that date we moved camp to two kilometers east of Perote and searched especially for ground squirrels. Leaving there on October 13, we went north, through Tezuitlan, Puebla, and then back east to the state of Veracruz, and camped four kilometers west of Tlapacoyan, October 13 to 17. On October 17 we drove farther east, and camped five kilometers east-northeast of El Jobo. There we found mammals so scarce that we left the area and returned to Potrero on October 20.

On October 27 we again went northward, through the city of Veracruz, and camped seven kilometers north-northwest of Cerro Gordo. We remained there until October 30, when we drove westward to the edge of the plateau and camped overnight four kilometers south of Jalacingo. On October 31 we drove on and camped three kilometers southwest of San Marcos, where we collected for several days. On November 5 we drove eastward to the gulf, and northward, stopping nine kilometers northwest of Nautla. Land crabs in great numbers here prevented successful collecting of mammals, and we drove, *via* San Marcos, north to three kilometers west of Gutierrez Zamora on November 6. We went still farther north on November 9, camping that night four kilometers east of Papantla and next day moved camp to 10 kilometers northwest of Papantla. On November 11 we moved camp to five kilometers south of Tehuatlan and remained there until November 15 when we started the return trip, trapping nine kilometers east of Papantla on the nights of November 15, 16 and 17. On November 18 we had heavy rains; on the 19th we reached Martínez de la Torre and remained there overnight. On November 20 we camped again four kilometers west of Tlapacoyan, remaining until November 25 when we drove *via* Tezuitlan, Jalacingo, Altotonga, Perote, and Jalapa to seven kilometers north-northwest of Cerro Gordo where we made collections until November 28 when we returned to Potrero Viejo.

On December 5, Angel Carrillo was employed as assistant, and he and I, on that date, left Potrero and drove over the newly constructed highway to Mirador. Hacienda Mirador still was inhabited by the Sartorius and Grohman families, as it was when Sumichrast obtained specimens there nearly 100 years

before we did. E. W. Nelson collected there in 1894. The Grohman family kindly invited us to live at Hacienda Mirador while we were working in that area. We stayed at Mirador until December 10, and then moved east to a place 15 kilometers east-northeast of Tlacotepec, remaining there until December 14. We then started back to Potrero Viejo, trapping on December 14 to 16 four kilometers west of Paso de San Juan; on December 16 to 18 three kilometers west of Boca del Río; and on December 18 to 20 one kilometer east of Mecayucan. On December 20 we returned to Potrero Viejo. We left there on December 28, spent the night in Cordoba, and took the train southward the next day. We spent the following night at Rodriguez Clara, a division point, and the next morning took the train to San Andrés Tuxtla, arriving on the evening of December 30. The Tuxtla area was rich in mammals, and we remained there until January 21, 1948, when we returned *via* Cordoba to Potrero Viejo.

On February 2, Carrillo and I (Dalquest) left Potrero Viejo, took the train southward to the Isthmus, and descended the Río Jaltipéc and Río Coatzacoalcos by dugout to a locality known as Zapotal, a collection of native houses on the riverbank. There we established a base, for operations in the Isthmus, living with the Indians whom I (Dalquest) had met on the visit to that area in the previous year. We reached Zapotal on February 5, and remained until May 3, except for the period of February 24 to March 19, when I (Dalquest) returned to the United States on business. The rainy season started early in May, 1948, and on May 20, 1948, I (Dalquest) reached Laredo on the return trip to the United States.

In May and June, 1948, Mr. Dyfrig Forbes obtained several valuable mammal specimens for us, in the immediate vicinity of Potrero Viejo. Actual collecting for the 1948-1949 season was started at Potrero Viejo on September 14, 1948, with Angel Carillo again as assistant. On September 19, we left for the desert near Perote, arriving that evening. From a base at the town of Perote we collected west and north of the town, and also two and three kilometers west of Limón. We remained at Perote until October 1. On that date we moved our base eastward to the pine forest and lava area about Las Vigas, and from a base at Las Vigas collected specimens from within a three kilometer radius. Mammals were abundant, in spite of the cold weather, and our collecting trunks were filled when we left there on October 21. We arrived at Potrero Viejo on October 22. We remained at Potrero Viejo until November 2, when we left and drove through Huatusco to Jalapa, Puebla, and Mexico City, northward through Pachuca, Real del Monte, and Atotonilco to collect in the extreme western part of the Chicontepec Rincón. We obtained specimens 10 kilometers southwest of Jacales on November 4 and 5, and at six kilometers west-southwest of Zacualpilla on November 6 to 10. On November 10, we drove eastward through Tulancingo, Hidalgo, and set traps seven kilometers west of El Brinco, Veracruz. Continuing southward from this locality, we trapped and hunted bats at Jalacingo on November 12 and 13. On November 14, we continued on to Potrero Viejo, obtaining specimens at Puente Nacional and Huatusco on the way. From November 17 to 27, we collected near Potrero Viejo, but on November 27, collected near Cautlapan, and spent the night at that town. On November 29, we drove to Coscomatepec, where we stayed until December 2, when we moved northward to Huatusco. We spent only one night at Huatusco, and returned to Cautlapan on December 3, and on to Potrero Viejo on December 4. On De-

ember 5 we made a trip to the Cumbres of Acultzingo with Mr. Forbes, collecting specimens, principally reptiles and amphibians, along the highway, and returned to Potrero Viejo that night. On December 8, we camped at Boca del Río, and the following day drove south along the Gulf to the port of Alvarado. There are no small mammals on the sands at Alvarado, because of the great numbers of land crabs. We spent several days trying to secure a manatee here, but failed. We did make arrangement with a fisherman to supply a specimen, and from him obtained a splendid skull a few weeks later. Leaving Alvarado on December 12, we drove through Veracruz and then westward to Puente Nacional, where we set traps that night. On December 13 we collected at Plan del Río, December 14 nine kilometers east of Totutla, and on December 15 at Cautlapan. We arrived at Potrero Viejo on December 16, and remained until December 29. On that date we drove to Teocelo where collecting was good, and we remained until January 10, 1949. On January 10 we drove to Las Vigas, where we remained until January 19, and returned to Potrero Viejo on January 20. On January 28 we started northward, stopping at Teocelo until February 1, then driving through Papantla to Tuxpan and west along the river to San Isidro, where we spent the night. The following day, February 4, we started northward along the road leading to Tampico, Tamaulipas. We collected at the following places: Potrero Llano, February 4; Cerro Azul, February 5; La Mar, February 6; El Cepillo, February 7; and Tampico Alto, February 8. On February 8, we drove back southward to La Mar, and then westward over a very bad road to Ozuluama, where we stayed until February 10. On February 10, we returned to La Mar, and on southward to Potrero Llano, where we remained until February 16. Along this entire route, we found small mammals to be rare, and only near Potrero Llano were specimens taken in fair numbers. We started back for Potrero Viejo on February 17, arriving on the 21st. From March 1 to 7, we were out of Veracruz, bringing the previous six months' catch to the border at Laredo. We returned to Potrero Viejo on March 11. We left Potrero on March 18, taking the railroad south to Jesús Carranza, on the Isthmus. We were fortunate in meeting an Indian friend there the following day, and he took us and our equipment to Zapotal, where we were greeted by our friends of the previous two years. We spent the time between March 20 and April 14 collecting on the Río Coatzacoalcos and Río Chalhijapa, east and south of Jesús Carranza. We returned to Potrero Viejo on April 2. On April 20, Carrillo was sent back to Zapotal, where I joined him on May 1. Between May 1 and May 16 we collected on the Río Coatzacoalcos and Río Solusuchil, southeast and east of Jesús Carranza. In 1949, collecting in Veracruz by Dalquest was terminated on June 5.

In the period April 22-26, 1949, W. W. Dalquest and E. R. Hall, for part of the time accompanied by Mrs. E. R. Hall, visited many of the places where mammals had been collected in the previous three years by Dalquest. Our itinerary follows:

April 22, from Mexico City east through Huauchinango, Puebla, Poza Rica (Veracruz), Papantla, Gutierrez Zamora, Tecolutla, to within two kilometers of Nautla, southwest through Tlapacoyan to Tezuitlan (Puebla) where we spent the night. April 23, to Jalacingo, Altotonga, Perote, Limón, to border of state of Puebla, back to Perote, Las Vigas, almost to city of Veracruz then



southwest across Río Jamapa at Boca del Río, thence southwest through Peñuela, thence northeast seven kilometers to Potrero Viejo. April 24, caves (including Ojo de Agua) 13 miles west-northwest of Potrero Viejo, and another cave seven kilometers northwest of Potrero. April 25, Potrero Viejo, Cordoba, Orizaba, Acultzingo, Tehuacan, Limón, Perote, Las Vigas, Jalapa, Coatepec, Jico, Teocelo, back to Jalapa thence Puente Nacional, Huatusco, Coscomatepec, Fortín to Cordoba where we spent the night. April 26, to San Juan de la Punta, to within nine kilometers of Boca del Río, to Alvarado, back to place nine kilometers west of Boca del Río, to Boca del Río, then back west to Peñuela and to Potrero Viejo. April 27, *via* Cordoba and Orizaba to Mexico City.

In the period January 12 through January 24, 1951, W. W. Dalquest, Rollin H. Baker, Alford J. Robinson and George P. Young visited the southern part of the state of Veracruz and collected several mammals. With reference to the town of Jesús Carranza the localities of capture of mammals on this trip were as follows: 20 km. E (Boca del Río Chalchijapa); 37 km. E and 7 km. S (Arroyo Saoso); 20 km. ESE; 24 km. E and 7 km. S; 26 km. E and 8 km. S (Arroyo Azul).

On July 21, 1955, Rollin H. Baker, R. W. Dickerman, J. Keever Greer, DeLayne Hudspeth, John William Hardy, Charles M. Fugler, Robert L. Packard, Robert G. Webb, and South Van Hoose, drove northward, from Tollocita [= Tolloosa], Oaxaca, taking the ferry over the Río Altapec near Jesús Carranza, *via* Acayucan, and camped five miles south of Catemaco. On July 22 the party drove to San Andrés Tuxtla, to five miles southeast of Lerdo de Tejada, to Alvarado, to the city of Veracruz. On July 24 the route was Veracruz, Jalapa, Perote, Tezuítlan (in Puebla), three miles northwest Nautla. On July 25 the party drove from three miles northwest Nautla to Tecolutla, Papantla, Poza Rica into the state of Puebla.

In 1960 M. Raymond Lee collected mammals for the University of Kansas Museum of Natural History in the northern part of the state of Veracruz—from February 27 to March 3 at places 10, 19 and 25 miles west of Tampico and a place five miles south of Tampico. From March 6 to April 10 he collected at Tuxpan, at places four and six kilometers north thereof, at places seven, nine, 12, 14, 15, 17, 25, 35 and 50 kilometers northwest of Tuxpan, at places four and five kilometers east of Tuxpan, and at places four and five kilometers northeast of Tuxpan. Again on April 18 he collected at the place four kilometers northeast. In this period, from March 29 to April 6, he collected at Hacienda Tamiahua, Cabo Rojo and on April 5 also on Isla Burros and the south end of Isla Juana Ramirez, both islands being in the Laguna de Tamiahua. From April 12 to 15 he collected at Zacualpan and three kilometers to the west; on April 16 two kilometers north of Los Jacales; on April 19 and 21 at Tlacolula; on April 20 at Ixcatepec; and on April 21 also at Piedras Clavadas and again at the place 35 kilometers northwest of Tuxpan.

In 1961 Percy L. Clifton and J. H. Bodley collected vertebrates for the University of Kansas Museum of Natural History in the northern part of the state of Veracruz—on September 10 and 11 at a place one mile east of Higo, 500 feet elevation; September 12-14, at Platón Sánchez, 800 feet elevation; and, September 18-25, twelve and one-half miles north of Tihuatlán, 300 feet elevation.

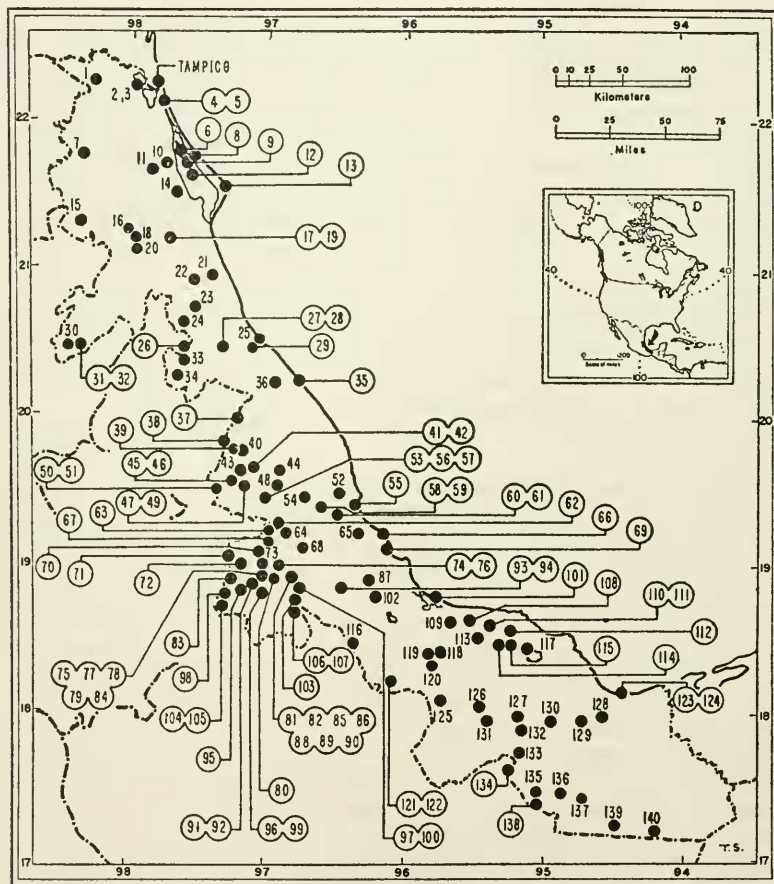


FIG. 1. Localities that are numbered in the Gazetteer (pp. 182-186). In the numerical sequence north takes precedence over south and west over east.

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|------------------------|----------------------|
| 1. Chijol              | 13. Cabo Rojo        |
| 2. Tamós               | 14. La Mar           |
| 3. Hacienda El Caracol | 15. Platón Sánchez   |
| 4. Tampico Alto        | 16. Ixcatepec        |
| 5. Rivera              | 17. Cerro Azul       |
| 6. Isla Juana Ramírez  | 18. Piedras Clavadas |
| 7. Higo                | 19. Potrero Llano    |
| 8. Hacienda Tamiahua   | 20. Tlacolula        |
| 9. Isla Burros         | 21. Tuxpan           |
| 10. El Cepillo         | 22. San Isidro       |
| 11. Ozuluama           | 23. Tihuatlán        |
| 12. Laguna Tamiahua    | 24. Miahuapa         |

- |  |  |
|--|--|
| 25. Tecolutla                            | 83. Xuchil                                       |
| 26. El Brinco                            | 84. Cuautlapan                                   |
| 27. El Tajín                             | 85. Cueva de la Pesca, Potrero                   |
| 28. Papantla                             | 86. Potrero                                      |
| 29. Gutiérrez Zamora                     | 87. Mecayucan                                    |
| 30. Jacales                              | 88. Peñuela                                      |
| 31. Zacualpan                            | 89. Parajo Nuevo                                 |
| 32. Zacualpilla                          | 90. Potrero Viejo                                |
| 33. Tulapilla, La                        | 91. Orizaba                                      |
| 34. Coyutla                              | 92. Cautlapan                                    |
| 35. Nautla                               | 93. Sala del Agua                                |
| 36. San Marcos                           | 94. El Maguey                                    |
| 37. Tlapacoyan                           | 95. Río Blanco                                   |
| 38. Jalacingo                            | 96. Tuxpango                                     |
| 39. Altotonga                            | 97. San Juan de la Punta                         |
| 40. Acatlán                              | 98. Maltrata                                     |
| 41. Las Vigas                            | 99. Necostla (Necoxtla)                          |
| 42. Volcancillo (= Cerro de los Pajaros) | 100. Dos Caminos                                 |
| 43. Sierra de Agua                       | 101. Alvarado                                    |
| 44. Santa María                          | 102. Piedras Negras                              |
| 45. Perote                               | 103. Omaelca                                     |
| 46. Guadalupe Victoria                   | 104. Río Blanco                                  |
| 47. Los Conejos                          | 105. Acultzingo                                  |
| 48. Jalapa                               | 106. Presidio                                    |
| 49. Pescados (= Los Pescados)            | 107. Motzorongo                                  |
| 50. Limón                                | 108. Lerdo de Tejada                             |
| 51. Cofre de Perote                      | 109. Tlacotalpam                                 |
| 52. Hacienda Tortugas                    | 110. Uvero                                       |
| 53. Jico (= Xico)                        | 111. Tula  |
| 54. Cerro Gordo                          | 112. Volcán de Tuxtla (Volcán San Martín Tuxtla) |
| 55. San Carlos                           | 113. San Juan de los Reyes                       |
| 56. Teocelo                              | 114. Santiago Tuxtla                             |
| 57. Texolo                               | 115. San Andrés Tuxtla                           |
| 58. Plan del Río                         | 116. Tierra Blanca                               |
| 59. Carrizal                             | 117. Catemaco                                    |
| 60. Puente Nacional                      | 118. Río Tesechoacán                             |
| 61. Chichicaxtle                         | 119. Cosamaloapan                                |
| 62. Mirador                              | 120. Tilapa                                      |
| 63. Totutla                              | 121. Río Papaloapam                              |
| 64. Tlacotepec                           | 122. Otatitlán                                   |
| 65. Paso de San Juan                     | 123. Río Coatzacoalcos                           |
| 66. Veracruz                             | 124. Coatzacoalcos                               |
| 67. Huatusco                             | 125. Pérez                                       |
| 68. Río Jamapa                           | 126. Paso Nuevo                                  |
| 69. Boca del Río                         | 127. Pasa Nueva                                  |
| 70. Coscomatepec                         | 128. Minatitlán                                  |
| 71. Mt. Orizaba                          | 129. Jaltipan                                    |
| 72. Xometla Camp                         | 130. Acayucan                                    |
| 73. Monte Blanco                         | 131. Jimba                                       |
| 74. Río Atoyac                           | 132. San Juan Evangelista                        |
| 75. Metlác                               | 133. Achotal                                     |
| 76. Ojo de Agua                          | 134. Buena Vista                                 |
| 77. Sumidero                             | 135. Jesús Carranza                              |
| 78. Fortín                               | 136. Río Chalchijapa                             |
| 79. Río Metlác                           | 137. Arroyo Saoso                                |
| 80. Córdoba                              | 138. Arroyo Azul                                 |
| 81. Atoyac                               | 139. Río Solosuchi (= Río Solosuchil)            |
| 82. Grutas Atoyac                        | 140. Isthmus of Tehuantepec                      |

## GAZETTEER

The following names of places and geographical features are those to which reference is made in this paper. The spellings are based principally on the American Geographical Society's "Map of Hispanic America on the scale of 1:1,000,000 (Millionth Map)" and its accompanying Index (1944). Latitude north of the equator is followed by longitude west of Greenwich. Numbers in brackets refer to the position of the places on the accompanying map (Fig. 1).

- Acatlán 19 43 N, 97 10 W [40]  
 Acayucan 17 57 N, 94 55 W [130]  
 Achotal 17 44 N, 95 08 W [133]  
 Acultzingo 18 42 N, 97 18 W [105]  
 Altotonga 19 46 N, 97 14 W [39]  
 Alvarado 18 47 N, 95 45 W [101]  
 Arroyo Azul 17 22 N, 95 01 W [138]  
 Arroyo Saoso (37 km. E and 7 km. S Jesús Carranza) 17 24 N, 94 41 W [137]  
 Atoyac 18 54 N, 96 47 W [81]  
 Boca del Río 19 06 N, 96 07 W [69]  
 Buena Vista 17 37 N, 94 14 W [134]  
 Cabo Rojo 21 34 N, 97 20 W [13]  
 Carrizal 19 22 N, 96 39 W [59]  
 Catemaco 18 25 N, 95 06 W [117]  
 Cautlapan (Ixtaczoquitlán) 18 51 N, 97 03 W [92]  
 Cerro Azul 21 12 N, 97 43 W [17]  
 Cerro de los Pajaros (see Volcancillo, authority of W. W. Dalquest)  
 Cerro Gordo 19 25 N, 96 42 W [54]  
 Chichicaxtle 19 20 N, 96 28 W [61]  
 Chijol (Chijal on some labels) 22 15 N, 98 16 W [1]  
 Coatzacoalcos (Puerto México) 18 08 N, 94 24 W [124]  
 Cofre de Perote 19 29 N, 97 21 W [51]  
 Córdoba 18 54 N, 96 56 W [80]  
 Cosamaloapan 18 22 N, 95 48 W [119]  
 Coscomatepec 19 04 N, 97 02 W [70]  
 Coyutla 20 15 N, 97 39 W [34]  
 Cuautlapan 18 53 N, 97 02 W [84]  
 Cueva de la Pesca, Potrero 18 53 N, 96 47 W [85]  
 Dos Caminos 18 47 N, 96 42 W [100]  
 El Brinco 20 27 N, 97 37 W [26]  
 El Cepillo 21 42 N, 97 45 W [10]  
 El Maguey (El Magay on some labels) 18 50 N, 96 43 W [94]  
 El Tajín 20 27 N, 97 23 W [27]  
 Fortín 18 54 N, 97 00 W [78]  
 Grutas Atoyac 18 54 N, 96 46 W [82]  
 Guadalupe Victoria (Agutepec) 19 32 N, 97 16 W [46]  
 Gutiérrez Zamora 20 27 N, 97 06 W [29]  
 Hacienda El Caracol, 5 km. SW Tamós Approximately 22 11 N, 98 01 W [3]



- Hacienda Tamiahua 21 44 N, 97 33 W [8]  
Hacienda Tortugas Possibly within 50 kilometers of 19 28 N, 96 28 W [52]  
(Hda. Tortugas is the type locality of *Eira barbara senex*; the type locality is at an elevation of approximately 600 feet in the District [= Municipio] of Jalapa.)  
Higo 21 46 N, 98 22 W [7]  
Huatusco 19 09 N, 96 57 W [67]  
Isla Burros 21 43 N, 97 36 W [9]  
Isla Juana Ramírez 21 47 N, 97 39 W [6]  
Isthmus of Tehuantepec 17°-18° N, 94°-95° W [140]  
Ixcatepec (Sta. María) 21 14 N, 98 01 W [16]  
Jacales 20 26 N, 98 27 W [30]  
Jalacingo 19 48 N, 97 18 W [38]  
Jalapa 19 31 N, 96 55 W [48]  
Jaltipan 17 58 N, 94 43 W [129]  
Jesús Carranza (Santa Lucrecia) 17 26 N, 95 01 W [135]  
Jico (Xico) 19 25 N, 97 00 W [53]  
Jimba 17 56 N, 95 23 W [131]  
Laguna Tamiahua 21 38 N, 97 35 W (central point of the lake) [12]  
Lagunas (Not found; Osgood, 1909:201, lists *Peromyscus mexicanus mexicanus* from this locality.)  
La Mar 21 31 N, 97 41 W [14]  
Las Vigas 19 38 N, 97 05 W [41]  
Lerdo de Tejada Approximately 18 36 N, 95 31 W [108] (Mentioned in R. H. Baker's itinerary on file in Museum of Natural History of The University of Kansas.)  
Limón (= San Antonio Limón) 19 30 N, 97 21 W [50]  
Los Conejos Approximately 19 31 N, 97 09 W (on north slope of Cofre de Perote) [47]  
Los Pescados (see Pescados)  
Maltrata 18 47 N, 97 16 W [98]  
Mecayucan 18 53 N, 96 15 W [87]  
Metlác Approximately 18 56 N, 97 00 W [75] (A power plant on the Río Metlác; approximately three kilometers northerly from Fortín according to field notes of W. W. Dalquest.)  
Miahuapa 20 37 N, 97 37 W [24] (See also Tulapilla, La, in account of *Peromyscus leucopus mesomelas*.)  
Minatitlán 17 59 N, 94 33 W [128]  
Mirador 19 17 N, 96 54 W (W. W. Dalquest, field notes) [62]  
Monte Blanco 18 59 N, 97 00 W [73]  
Motzorongo 18 39 N, 96 45 W [107]  
Mt. Orizaba 19 02 N, 97 16 W [71]  
Nautla 20 13 N, 96 46 W [35]  
Necostla (Necoxtla) 18 47 N, 97 01 W [99]  
Necoxtla (see Necostla)  
Ojo de Agua (a cave, and a spring which is the source of a river) 18 56 N, 96 54 W (W. W. Dalquest, field notes) [76]  
Omaelca (Omaelco) 18 45 N, 96 46 W [103]  
Orizaba 18 51 N, 97 05 W [91]  
Otatitlán 18 11 N, 96 02 W [122]  
Ozuluama (Ozulama on labels) 21 40 N, 97 51 W [11]  
Papantla 20 27 N, 97 19 W [28]  
Paraje Nuevo 18 52 N, 96 52 W (W. W. Dalquest, field notes) [89]

- Paso de Ovejas 19 17 N, 96 26 W (Not shown on Fig. 1.)
- Pasa Nueva Here (see map) is shown at 17 59 N, 95 11 W on the authority of Wetmore (1943:216, 217) who has told one of us (Hall) that he (Wetmore) had obtained verbal information from Colburn as to the location of the place concerned. Colburn collected the specimens that J. A. Allen (1904:29) recorded from "Pasa Nueva." Possibly Allen did not talk with Colburn about the exact position of the place and perhaps relied on some other source that caused him (Allen) to state that the location was "a short distance from Tlacotalpan, about 60 miles south of the city of Vera Cruz. . . ." Nava (Direc. Gen. Correos y Telégrafos de los Estados Unidos Mexicanos, 1892, p. 203) listed a "Paso Nuevo" as a rancho near Cosamaloapam. It was because Allen's statement as to location was plausible that Lowery and Dalquest (1951:541) tended to think of the locality as at approximately 18 23 N, 95 48 W. Possibly that is correct but because Wetmore had advice from the collector, Colburn, it is probable that the specimens were collected at 17 59 N, 95 11 W. [127]
- Paso de San Juan 19 12 N, 96 19 W [65]
- Paso Nuevo 18 01 N, 94 26 W [126]
- Peñuela 18 52 N, 96 54 W [88]
- Pérez 18 04 N, 95 43 W [125]
- Perote 19 34 N, 97 14 W [45]
- Pescados 19 30 N, 97 08 W (W. W. Dalquest, field notes) [49]
- Piedras Clavadas "75 km. NW Tuxpan" 21 11 N, 97 59 W [18]
- Piedras Negras 18 46 N, 96 11 W [102]
- Plan del Río 19 23 N, 96 36 W (W. W. Dalquest, field notes) [58]
- Platón Sánchez 21 17 N, 98 22 W [15]
- Potrero 18 53 N, 96 47 W [86]
- Potrero Llano (= Potrero del Llano) 21 10 N, 97 43 W (W. W. Dalquest, field notes) [19]
- Potrero Viejo 18 52 N, 96 50 W [90]
- Presidio 18 39 N, 96 46 W (W. W. Dalquest, field notes) [106]
- Puente Nacional 19 20 N, 96 29 W [60]
- Río Alvarado (see Río Papaloapam, W. W. Dalquest, field notes)
- Río Atoyac 18 58 N, 96 54 W [74] SE to junction with Río Jamapa at 18 50 N, 96 40 W (W. W. Dalquest, field notes) Some maps give Río Atoyac also for the lower part of the river to which the name Río Jamapa is applied in our present account of the mammals of Veracruz.
- Río Blanco (village) 18 49 N, 97 09 W [95]
- Río Blanco 18 43 N, 97 18 W, east into Laguna Tlalixcoyan (a part of Laguna de Alvarado) at 18 45 N, 95 50 W [104]
- Río Chalchijapa From across Oaxacan boundary at 94 46 N (where named Río Alegre) northerly to Boca Chalchijapa (17 26 N, 94 50 W) at confluence with Río Coatzacoalcos [136]
- Río Coatzacoalcos From Oaxacan boundary at 17 20 N, 94 59 W, NE into sea at Puerto México (18 09 N, 94 25 W) [123]
- Río Jamapa 19 06 N, 96 43 W, E into sea at Boca del Río (19 06 N, 96 07 W) [68]
- Río Metlác A river, tributary to the Río Blanco, running from NW to SE at Fortín (W. W. Dalquest) [79]
- Río Papaloapam From Oaxacan boundary at 18 11 N, 96 06 W, NE into Laguna de Alvarado (18 43 N, 95 45 W) [121]
- Río Solosuchi (= Río Solosuchil) 17 14 N, 94 28 W, NW into Río Chalchijapa at 17 22 N, 94 47 W [139]
- Río Tesechoacán This is a continuation northward of the Río Playa Vicente.

- From Pérez the river continues northward to its junction with the Río Papaloapam at 18 24 N, 95 43 W [118]
- Rivera 22 06 N, 97 46 W [5]
- Sala del Agua 18 50 N, 96 43 W [93]
- San Andrés Tuxtla 18 27 N, 95 13 W [115]
- San Carlos 19 24 N, 96 21 W [55]
- San Isidro 20 56 N, 97 33 W [22]
- San Juan de la Punta 18 49 N, 96 44 W [97]
- San Juan de los Reyes 18 31 N, 95 27 W [113]
- San Juan Evangelista 17 53 N, 95 08 W [132]
- San Marcos 20 12 N, 96 57 W [36]
- Santa María Approximately 19 37 N, 96 54 W (see Goldman 1951:281) [44]
- Santiago Tuxtla 18 28 N, 95 18 W [114]
- Sierra de Agua 19 37 N, 97 11 W [43]
- Sumidero 18 54 N, 97 01 W [77]
- Tamós 22 13 N, 97 59 W [2]
- Tampico (in state of Tamaulipas) 22 13 N, 97 51 W
- Tampico Alto 22 06 N, 97 48 W [4]
- Tecolutla 20 29 N, 97 01 W [25]
- Teocelo 19 23 N, 96 58 W [57]
- Texelo (possibly Teocelo; the Barranca of Texelo is one kilometer north of Teocelo but we do not know of any town or village bearing the name Texelo) 19 23 N, 96 58 W [57]
- Tierra Blanca 18 26 N, 96 21 W [116]
- Tihuatlán (Tehuatlan on specimen labels) 20 43 N, 97 33 W [23]
- Tilapa 18 18 N, 95 47 W [120]
- Tlacolula 21 06 N, 97 58 W [20]
- Tlacotalpam (= Tlacotalpan) 18 37 N, 95 39 W [109]
- Tlacotepec 19 12 N, 96 50 W [64]
- Tlapacoyan 19 58 N, 97 13 W [37]
- Totutla 19 13 N, 96 57 W [63]
- Tula 18 36 N, 95 22 W [111]
- Tulapilla, La 20 21 N, 97 37 W [33]
- Tuxpan 20 57 N, 97 24 W [21]
- Tuxpango 18 49 N, 97 01 [96]
- Tuxtla (probably refers to Santiago Tuxtla)
- Ubero (see Uvero)
- Uvero (Ubero) Approximately 18 36 N, 95 25 W [110] Sumichrast (1882:228) identifies Uvero as a locality between Alvarado and Santiago Tuxtla. According to García y Cubas (Diccionario Geográfico, Histórico y Biográfico de los Estados Unidos Mexicanos, México, 1881-1891), Uvero is 20 kilometers northwest of Santiago Tuxtla. Ubero, from which place *Oryzomys palustris couesi* has been recorded, may be another spelling for the same place.
- Veracruz 19 12 N, 96 08 W [66]
- Volcán de Tuxtla (see Volcán San Martín Tuxtla) 18 33 N, 95 13 W [112]
- Volcán San Martín Tuxtla (see Volcán de Tuxtla)
- Volcancillo (Cerro de los Parajos) 19 38 N, 97 04 W [42] A volcanic cone three kilometers east of Las Vigas (W. W. Dalquest).
- Xico (see Jico)
- Xometla Camp, Mt. Orizaba Probably is Xomitla at 18 59 N, 97 10 W [72]

- Xuchil 18 53 N, 97 14 W [83] (Name appears on labels of specimens collected from June 14 to 18 inclusive by Edmund Heller and C. M. Barber.)  
 Zacualpan 20 26 N, 98 21 W [31]  
 Zacualpilla 20 25 N, 98 22 W [32]

## CHECK LIST

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## Order MARSUPIALIA

## Family Didelphidae

*Didelphis marsupialis*

## Opossum

The usual name in Veracruz is "tlacuache." In some places the name "zorro" is used, not to be confused with "zorra," or fox.

The opossum seems to be found in all life-zones save, probably, the Arctic-Alpine. The animal was reported to us from the high, coniferous forest, at 10,500 feet elevation on the Cofre de Perote, though we did not take it there. The opossum is common near Las Vigas, in the pine forest at 8000 feet elevation, and also on the sandy, arid desert near Perote, where we trapped one specimen along the cut-bank of a sandy arroyo. The opossum is most abundant in thickets and jungle near water, such as streams, rivers and lakes, and extensive cultivated fields of sugar cane or corn. At the upper edge of the upper humid division of the Tropical Life-zone we took specimens along cold, swift streams supporting rainbow trout. In the lower humid division of the Tropical Life-zone, opossums were obtained along shores of deep, slow rivers in steaming jungles.

Homes of several opossums were discovered in Veracruz. One was found, by a dog, in dense jungle, 20 kilometers west-northwest of Piedras Negras, on May 12, 1946. The dog began to bark at the bottom of a cut-bank of an arroyo where a log, about 15 inches in diameter and 35 feet long, lay parallel to the bank and about six inches away. Slumps of earth mixed with branches, roots and leaves formed a rough roof over the cavity between the bank and the log. Digging revealed a medium-sized opossum in the cavity, and a mass of dry, dead leaves.

On May 19, 1946, nests of the red-bellied squirrel (*Sciurus aureogaster*) were being examined in an arroyo near the Río Blanco, 20 kilometers west-northwest of Piedras Negras. A small opossum was frightened from one squirrel nest, a rounded ball of dry leaves approximately 15 inches in diameter. The opossum escaped by running along branches of the trees.

At Jesús Carranza the home of an opossum was in a hollow mahogany log that had been cut for lumber and left lying among many similar logs. The log was about three feet in diameter and 30 feet long. A cavity through the center was about eight inches in diameter. At the lower end, this cavity was partly filled with earth, seemingly tracked into the cavity by some animal. Investigation showed that the cavity extended the full length of the log, but light did not show through. When a long pole was pushed into the hollow, an opossum emerged from the other end. The cavity in the log had been partly obstructed by dry leaves, not, it seemed, in the form of a nest, but scattered along the entire length of the hollow.

The opossum seems to be completely nocturnal. Night hunting with a headlamp usually discloses one or two opossums each night in suitable habitat. At the Río Blanco, 20 kilometers west-northwest of Piedras Negras, eight were seen in a few hours in one night. One was in an open area of tall grass; one was at the base of a sandy cut-bank; six were in trees and vines in the jungle, five to 10 feet from the ground. Opossums wander from the jungle at times. At our camp, seven kilometers southeast of San Juan de la Punta, on December 15, 1946, they were common in the jungle along the Río Jamapa. One, however, was found in a flat-topped acacia tree isolated in an extensive grassland, fully 2500 feet from the jungle. The acacia is not a fruit tree, and it is not known why the animal was in the tree.

Opossums may be social to some extent. It is not unusual to catch two or more in traps set close together. Eight kilometers northwest of Potrero this was true. Four kilometers west-northwest of Fortín, at 3200 feet elevation, an opossum was obtained on March 28, 1946. Although traps were set daily, no other opossums were taken until April 2, when two males were found in traps set 50 feet apart.

Although a rather clumsy animal on the ground, the opossum is a swift, sure and agile climber. The brilliant red eyes seen by means of a reflected light at night are often at considerable heights above the ground. In the lowlands opossums rarely have any fat beneath the skin, but in the uplands characteristically have a deep layer of fat, especially in winter. Tails of younger animals are usually clear white and jet black; in older animals the white becomes duller and the black becomes grayish.

In jungle areas, the food of the opossum probably consists mainly of fruit; the jobo plum and several species of wild figs are favored

food. To humans these fruits have a bitter or pitchlike taste. Some domestic fruits, such as banana, papaya and mango are eaten. No insects were found in stomachs examined. On a few occasions opossums followed trap lines, eating captured animals, and had to be caught before trapping for small species could be continued successfully. One opossum, obtained in the desert, contained remains of *Dipodomys phillipsii* and *Peromyscus maniculatus*. We found the opossum easy to trap by using carrion (bird, mammal or fish) as bait.

In some parts of Mexico and the United States the opossum is used as food. This is not true in Veracruz; when questioned about eating opossum, most residents were disgusted by the idea. The opossum does some damage to fruit and chickens, but is so easily captured, especially by dogs, that it is not a serious pest. The fur of the opossum in Veracruz is of no value, although the fur of the animals that live in the uplands possibly could be marketed.

We learned little concerning the breeding habits of the common opossum in Veracruz. Occasionally two specimens, a male and a female, were taken in adjacent traps. Three kilometers southeast of Orizaba, at 5500 feet elevation, a female was caught in a trap on December 9, 1946, about two hours after dark. Before she was removed from the trap, the beam of a flashlight was played on nearby trees, in order to reveal owls or other predators that might have been attracted by the struggles of the trapped animal. A large male opossum was found in the tree directly over the trapped female. An adult female with nine young in the pouch was obtained four kilometers west-northwest of Fortín, at 3200 feet elevation, on March 28, 1946. Fifteen kilometers east-southeast of San Juan de la Punta, on September 27, 1946, an adult female and a young male, about one-quarter grown, were shot from a strangler fig tree, where they were feeding at about 10:00 p. m.

Opossums obtained in the highlands of Veracruz were all in seemingly good health; they were fat and had long, soft fur. In the lowlands they were usually lean and had thin, coarse fur. Many specimens from the lowlands had scabby patches of bare skin; a nodulelike, crusted mass in the skin at the base of the fur, usually on the back, was common. Ectoparasites were not common on opossums in Veracruz. An animal taken two kilometers west of Jico, 4200 feet elevation, had several large ticks.

Several opossums, perhaps a dozen, were found dead along streams or in fields, but the cause of death was not determined.

Other animals of similar size, rabbits, for example, were almost never found dead.

### *Didelphis marsupialis californica* Bennett

*Specimens examined*.—Total 14: Hacienda Tamiahua, Cabo Rojo, 3; 17 km. NW Tuxpan, 2; 9 km. NW Tuxpan, 1; Tuxpan, 1; 12½ mi. N Tihuatlán, 300 ft., 1; 2 km. E Perote, 8300 ft., 1; 5 km. N Jalapa, 4500 ft., 2; 2 km. W Jico, 4200 ft., 1; 3 km. SE Orizaba, 5500 ft., 3.

Additional records.—Under the name "*Didelphis marsupialis*," J. A. Allen (1901:168) recorded specimens from: Las Vegas [= Vigas]; Jico; and Maltrata. Ingles (1959:380) recorded the species from 25 mi. NW of the City of Veracruz. Ferrari-Pérez (1886:130) recorded the species from Jalapa.

This subspecies occurs in the state on the highlands along the western border and in the northern part of the state. Longer and "softer" fur, shorter tail, and longer nasals (relative to postnasal part of the skull) than in *D. m. tabascensis* seem to characterize *D. m. californica*. Our specimens, excepting the one from 2 km. E of Perote, are intergrades between the two mentioned subspecies. Measurements of our largest male, No. 19055, are 963; 488; 76; 57; basilar length, 104.8; length of nasals, 55.3; zygomatic breadth, 58.4.

### *Didelphis marsupialis tabascensis* J. A. Allen

*Specimens examined*.—Total 57: 5 km. S Tehuatlán [= Tihuatlán], 700 ft., 6; 9 km. E Papantla, 300 ft., 1; 9 km. NW Nautla, 10 ft., 1; 3 km. SW San Marcos, 200 ft., 2; 4 km. W Tlapacoyan, 1700 ft., 2; Río Atoyac, 8 km. NW Potrero, 2; 4 km. WNW Fortín, 3200 ft., 3; Potrero Viejo, 1700 ft., 1; Río Blanco, 20 km. WNW Piedras Negras, 3; 15 km. ESE San Juan de la Punta, 2; 7 km. SE San Juan de la Punta, 2; Río Blanco, 20 km. W Piedras Negras, 3; 3 km. SE San Andrés Tuxtla, 1000 ft., 4; Coatzacoalcos, 1; Achotal, 17 (Chicago N. H. Mus.); 20 km. ENE Jesús Carranza, 200 ft., 1; 20 km. E Jesús Carranza, 300 ft., 2; 25 km. SE Jesús Carranza, 250 ft., 2; 34 km. SE Jesús Carranza, 400 ft., 1; 60 km. SE Jesús Carranza, 450 ft., 1.

Additional records.—Papantla (J. A. Allen, 1901:173); Mirador (*ibid.*); Boca del Río (Davis, 1944:374); Catemaco (J. A. Allen, 1901:173); Pasa Nueva (J. A. Allen, 1904:30); Minatitlán (J. A. Allen, 1901:168, as "*Didelphis marsupialis*").

The three largest skulls are Nos. 13776 and 13777, males, from Achotal and No. 23392, unsexed, from 5 km. S Tehuatlán. Measurements, respectively, are: basilar length, 120, 115.8, approximately 115.4; length of nasals, 56.5, 56.3, 57.0. The three next largest specimens, all males, are No. 17684 from 4 km. WNW Fortín, No. 66269 from Coatzacoalcos, and No. 32050 from 25 km. S Jesús Carranza. Measurements are, respectively, as follows: 959,853,852; 473,386,400; 71,65,71; 59,54,54; basilar length, 111.3, 104.2, 111.7; length of nasals, 57.7, 54.3, 58.4; zygomatic breadth, 63.8, 65.8, 65.3.

### *Philander opossum pallidus* (J. A. Allen)

#### Four-eyed Opossum

*Specimens examined*.—Total 50: 35 km. NW Tuxpan, 1; 25 km. NW Tuxpan, 1; Tuxpan, 2; 12½ mi. N Tihuatlán, 300 ft., 2; 3 km. SW San Marcos, 200 ft., 2; Teocelo, 4000 ft., 1; 3 km. W Boca del Río, 10 ft., 1; Boca del Río, 10 ft., 1; 5 km. SW Boca del Río, 2; Río Atoyac, 8 km. NW Potrero, 1700 ft., 3; 4 km. WNW Fortín, 3200 ft., 2; 7 km. W Potrero "1700 ft.," 1; Potrero Viejo, 1700 ft., 3; 3 km. SE Orizaba, 5500 ft., 5; Río Blanco, 20 km.



W Piedras Negras, 3; 2 km. N Motzorongo, 1500 ft., 2; 3 km. E San Andrés Tuxtla, 1000 ft., 6; Jimba, 350 ft., 1; 20 km. ENE Jesús Carranza, 200 ft., 2; 20 km. E Jesús Carranza, 300 ft., 2; 30 km. SSE Jesús Carranza, 300 ft., 2.

Additional records.—J. A. Allen (1901:216) lists specimens from Papantla; Chichicaxtle; Orizaba; Motzorongo; Catemaco. Córdoba and Huatusco (Sumichrast, 1882:32).

Our 24 males average larger than our 18 females. As would be expected, the sagittal crest increases with increasing age. Within each sex, the specimen having the highest sagittal crest has the greatest occipitonasal length. The two males (17672, 32057) having the highest sagittal crests yield measurements, respectively, as follows: 649, 530; 306, 280; 48, 40; 38, 34; occipitonasal length, 80.0, 76.7; nasal length, 37.1, 38.0. The two females having the highest sagittal crests are Nos. 19080 and 17676. They, respectively, yield corresponding measurements as follows: 612, 556; 300, 290; 44, 41; 37, 35; 78.0, 72.9; 37.7, 35.9.

Over most of Veracruz the four-eyed opossum is called "comadreja." In the uplands, near Jico and Jalapa, this name is applied to the weasel (*Mustela frenata*). Less commonly, the four-eyed opossum is called "ratón tlacuache," a name more usually used for the mouse-opossum, *Marmosa mexicana*.

The four-eyed opossum ranges throughout the tropics of Veracruz. At the extreme upper edge of the upper humid division of the Tropical Life-zone, it lives along cold, clear streams at the edge of the oak belt. Lower down, but still in the upper humid division, it was found along rivers and streams that flowed through dense jungle, where the tall, broad-leafed trees were thickly hung with orchids, vines, mosses and bromeliads. The four-eyed opossum was found living in thickets bordering the broad rivers of the coastal plain, in the arid division of the Tropical Life-zone, and along the marshy shores of rivers and streams of the lower humid division of the Tropical Life-zone, in the southern part of the state.

Most of our specimens were taken on the very shores of rivers or streams. Two examples show, however, that the species is not confined to such habitat. On May 21, 1946, at Potrero Viejo, seven kilometers west of Potrero, workers discovered a family of four young animals in a field of sugar cane, several kilometers from the nearest water at that time of the year. At Jimba, 350 feet elevation, in southern Veracruz, a four-eyed opossum was taken from a tree on a hillside fully three kilometers from the nearest water. These records are unusual, however. Against them are nearly 30 records from in and near water.

The four-eyed opossum seems to be entirely nocturnal. None was seen abroad by day, unless frightened from its daytime retreat, but one was seen shortly after dark.

At the Río Atoyac, eight kilometers northwest of Potrero, between February 19 and March 5, 1946, several four-eyed opossums were taken in a trail leading from a dense thicket of vines, bushes, thorny plants and creepers, to a stream ten feet away. Subsequently part of the thicket was cleared with machetes and a hole, about five inches in diameter that led downward beneath the roots of a tree, was discovered near the center of the thicket. This seemed to have been the home of at least one of the opossums. Several large basilisk lizards were living in the thicket.

Five kilometers southwest of Boca del Río, a four-eyed opossum was shot on the ground, near the base of a large "strangler fig" tree (*Ficus* sp.). As this tree was under observation for most of the day, it is assumed that the animal's home was in one of the numerous holes in the base of the tree, or in a hole in the ground beneath it.

Twenty kilometers east-northeast of Jesús Carranza, two of these opossums were found in nests that they had constructed in the palm thatch of the roofs of abandoned houses. These nests consisted of a handful of dry leaves, pushed in between the layers of palm fronds. From outside, a distinct spherical or oval lump in the thatch marked the site of the nest. Inside the house we could see no trace of the nests.

Twenty-five kilometers southeast of Jesús Carranza, the nest of a four-eyed opossum was found in a cavity in the side of a piece of tree trunk, 15 inches in diameter and three feet long, that was suspended in the air, by vines, seven feet over the surface of a dry wash. The nest was of dry leaves, about 11 inches deep and seven inches in diameter. When the vines supporting the section of tree trunk were slashed, the trunk fell to the ground and split open on the hard gravel. The opossum escaped.

Another four-eyed opossum was shot from the large hollow in the side of a giant "ligarón" tree. This tree was fully 12 feet in diameter at waist height, and contained a hollow about 60 feet high and five feet in diameter. The opossum was shot as it ran up the rough side of the hollow. The hollow was also the home of a colony of sac-winged bats of the species *Saccopteryx bilineata*.

On a few occasions, two four-eyed opossums were seen as close together as 50 feet, but otherwise they were solitary. Usually we saw one to three four-eyed opossums each night, while we hunted with a head lamp in suitable habitat. *Philander* seemed to be less common in most parts of Veracruz than *Didelphis*.

The actions of *Philander* differ from those of other marsupials that occur in Veracruz. *Philander* is quick and active. Trapped indi-

viduals are able to jump and twist about in surprising fashion. Care must be used to avoid being bitten when removing them from traps.

The four-eyed opossum is an agile climber and a skillful swimmer, but most of its hunting seems to be done on the ground, along the edges of streams. Along the Río Atoyac, eight kilometers northwest of Potrero, on the evening of February 18, 1946, a *Philander* was shot as it ran along a narrow trail halfway up a vertical bank about two meters in height. The trail was scarcely visible as it wound through moss and ferns. The animal fell into the stream below. A half hour later another *Philander* was shot only 50 to 60 feet distant from the first. The second one was on a horizontal branch or some dense vines about six feet above the surface of the stream, and also fell into the water.

Specimens are usually seen or trapped on the ground, but are sometimes seen in trees. Along the Río Atoyac several four-eyed opossums were taken in a trap set beneath the water level, at the base of a cut-bank. They could have reached the trap only by swimming. Seven kilometers southeast of San Juan de la Punta, on December 15, 1946, a four-eyed opossum was seen just before midnight, running swiftly over the large, rounded boulders (six to 18 inches in diameter) along the river bank. When frightened, the animal turned and made a smooth, clean dive into the swift water, and as it did not reappear, must have swum away under water.

In the lowlands these opossums seldom were fat but in the highlands, at 5000 feet elevation and higher, in winter, they had a deep layer of yellow fat immediately beneath the skin. *Didelphis* in the uplands likewise is fat in winter but in the lowlands usually is lean at all seasons.

The four-eyed opossum is omnivorous; it has been seen feeding on sweet-lemons, jobo plums, and the fruit of the Chico Zapote (*Sapote achras*, source of chewing gum). Five kilometers southwest of Boca del Río, at 10 feet elevation, on October 10, 1946, a four-eyed opossum was seen at the base of a large, hollow fig tree. The upper part of the hollow in the tree served as a retreat for a colony of the large fruit bat, *Artibeus jamaicensis*. Bats were bringing small, green figs into the hollow and feeding on them. Parts of the fruit, varying in size from almost whole figs to mere shreds, were dropped by the bats. The four-eyed opossum was feeding on these bits of figs.

On a number of occasions, four-eyed opossums followed our trap lines, eating mice and other small mammals that had been



captured. These opossums are easily trapped by using flesh, preferably much decayed, for bait.

The four-eyed opossum probably breeds at all times of the year. A female having six young in her pouch was found at a place four kilometers west-northwest of Fortín, 3200 feet elevation, on March 28, 1946. Four young were found in a field at Potrero Viejo, 1700 feet elevation, on May 21, 1946. A female having four young in the pouch was obtained five kilometers southwest of Boca del Río, 10 feet elevation, on October 10, 1946. Males having enlarged testes were taken on December 7, 1946, December 20, 1946, and March 3, 1947.

The ear of one *Philander* was diseased and partly missing. Many individuals were examined for ectoparasites but no parasites were found. Like other opossums, *Philander* has a strong, unpleasant odor.

### *Marmosa mexicana mexicana* Merriam

#### Mexican Mouse-opossum

*Specimens examined*.—Total 25: 4 km. W Tlapacoyan, 1700 ft., 5; 5 km. N Jalapa, 4500 ft., 8; 2 km. W Jalapa, 4200 ft., 1; 2 km. W Jico 4200 ft., 3; 4 km. WNW Fortín, 3200 ft., 1; 1 km. E Mecayucan, 200 ft., 1; Cautlapan, 1 (collection of E. H. Taylor); 3 km. SE Orizaba, 5500 ft., 1; 15 km. ESE San Juan de la Punta, 1; 25 km. ESE Jesús Carranza, 350 ft., 1; 25 km. SE Jesús Carranza, 250 ft., 1; 35 km. SE Jesús Carranza, 350 ft., 1.

Additional records (Tate, 1933:133, unless otherwise noted).— $1\frac{1}{2}$  mi. E Jalapa (J. A. Allen and Chapman, 1897:208); Texolo (not located; possibly = Teocelo); Veracruz; San André[s] Tuxtla; Pasa Nueva (J. A. Allen, 1904:29); Achotal.

The Mexican mouse-opossum occurs throughout the length of the state in the Tropical Life-zone.

The largest (17670, 4 km. W Fortín) of our 13 males and the largest female (32054, 35 km. SE Jesús Carranza), yield measurements, respectively, as follows: 273, 318; 149, 185; 20, 21; 22, 18; occipitonasal length, 33, 32.9; zygomatic breadth, 17.2, 17.6.

The Mexican mouse-opossum is not well known to the local residents of Veracruz. The only local name used seems to be "ratón tlacuache," literally, mouse-opossum.

The mouse-opossum reaches its maximum abundance in the densely forested areas at the upper edge of the upper humid division of the Tropical Life-zone. It is not a common species. Five kilometers north of Jalapa, at 5000 feet elevation, where it was found most abundantly it was in an approximate ratio of one mouse-opossum to eight mice. In most places it was far less common.

In the forested uplands this species was trapped in situations as follows: an area of giant elephant's ear in dense jungle, where the

trees overhead were heavily draped with orchids, bromeliads, mosses and vines; in dense bushes, composed of many species, about five feet high and on a steep hillside; along a trail through dense forest on a hillside of 20 degree slope; under a stump in a dense forest on a hill; under logs, stumps and roots of trees in dense forest (four animals); on a slope of 15 degrees, covered with dense grass, coffee and low bushes; beneath tree-ferns at the foot of a cliff; under a log near a cliff; in a patch of dense vegetation drenched by the spray of a waterfall; in brush and weeds on the steep side of a valley.

Two specimens were taken on the arid coastal plain. Here this species was rare, and occupied a habitat unlike that of the upland forest. One individual was trapped in tall grass on a level plain, where there were scattered bushes about five feet tall, 15 kilometers east-southeast of San Juan de la Punta, at 400 feet elevation. This specimen was so extensively eaten by ants that only the skull was saved. Another was taken one kilometer east of Mecayucan, at 200 feet elevation, in an area where there were many low, thorny bushes and much open ground. This individual is not fully adult, but is much paler than any other specimen from Veracruz.

Three specimens were saved from the dense jungles of the southern part of Veracruz. One was trapped in tall, dense grass on a flood plain of the Río Solosuchil, 25 kilometers east-southeast of Jesús Carranza, at 350 feet elevation. Another was taken 25 kilometers southeast of Jesús Carranza on March 31, 1949. This animal was shot at night. The trees overhead were so dense that little sunlight reached the forest floor, and as a result there was no understory vegetation, save for a few low palms and bushes a foot or so in height. The ground was level, dry and covered with a thin layer of dry leaves. The small, red eyes of the mouse-opossum were first seen at a distance of about 20 feet. The animal was on a twig of a bush about 10 inches from the ground. It jumped to the ground and turned to look at the light.

Another mouse-opossum was obtained 35 kilometers southeast of Jesús Carranza on April 7, 1949. On this date, at about ten o'clock at night, we were hunting in deep forest, similar to that 25 kilometers east-southeast of Jesús Carranza. A pair of small, red eyes were seen at the mouth of a hole in a cut-bank. The bank was composed of sand, was almost vertical and about a foot in height. The hole was 30 millimeters in diameter and 50 millimeters from the base of the cut-bank. The burrow was opened and was found to contain a nest of dry leaves, about a handful in quantity, in a

pocket about four inches in diameter and 16 inches from the entrance. An adult female mouse-opossum was captured in the nest. There were no young in the nest and the female was not lactating.

Mouse-opossums have an unpleasant, but not strong, musky odor. They are surprisingly tough; several that were caught just behind the necks in mousetraps were still alive the following morning, although the traps invariably killed mice larger than the mouse-opossums. One such animal, when removed from the trap, whipped its tail around a twig. When removed, its tail quickly fastened about the finger of its captor. It was much more dexterous with its tail than either *Didelphis* or *Philander*, but probably less so than *Caluromys*.

The mouse-opossum of Veracruz seems to be omnivorous. Animals were commonly taken in traps baited with banana, and one was taken in a meat-baited trap. Five kilometers north of Jalapa, the stomachs of two individuals contained only remains of insects, so finely chewed as to resemble the contents of the stomach of an insectivorous bat. Three stomachs held starchy, dull, grayish-white plant material, dark green in places. This may have been mostly acorns; acorns were abundant there at that time.

Two kilometers west of Jico, at 4200 feet elevation, the first three mice caught in a trap line had been eaten in the traps. The next trap held a *Marmosa*. Mice in the other traps, farther along the line, were untouched. I wondered if the mouse-opossum had eaten the three mice.

Mouse-opossums are rarely fat, but all of those taken seemed to be in good health. Only near Jalapa were ectoparasites found on this species. There one animal had a number of tiny yellow mites on the ears; one had a large, gorged tick clinging to the skin beneath one ear; one had a flea; two animals had three or four small mites each.

### *Caluromys derbianus aztecus* (Thomas)

#### Woolly Opossum

*Specimens examined*.—Total 8: 3 km. E San Andrés Tuxtla, 1000 ft., 6; 20 km. ENE Jesús Carranza, 300 ft., 1; 20 km. E Jesús Carranza, 300 ft., 1.

*Additional records*.—Potrero (seen alive); San Juan de la Punta (Thomas, 1913:359).

Potrero is the northernmost place from which we have record of this species in Veracruz.

The largest adult male (23668) and largest adult female (23369), both from 3 km. San Andrés Tuxtla, yield measurements, respectively, as follows: 698, 742; 411, 442; 45, 45; 42, 41; occipitonasal length, 59.0, 60.5; zygomatic breadth, 35.1, 34.0.

The wooly opossum seems to have no distinctive vernacular name in Veracruz. Specimens taken in the San Andrés Tuxtla area were referred to by natives, but rather doubtfully, as comadreja. This is the local name of the four-eyed opossum. On the Río Coatzacoalcos the wooly opossum was called zorro or zorro colorado. There are no foxes (zorras) in this area, where the name zorro is usually used for the common opossum (*Didelphis*).

Our specimens were all taken in dense jungle where there were vines and tall trees. The species was associated with *Didelphis*, *Philander*, *Potos flavus*, *Tylomys gymnurus* and *Coendou mexicanus*. These are all nocturnal, fruit-eating mammals.

The wooly opossum seems to be completely nocturnal. With one exception, all of our specimens were taken at night. The one taken in the daytime probably was frightened from its daytime hiding place by dogs. Twice, individuals were found about 20 minutes after dark. Others were taken from one hour after dark until as late as midnight.

*Caluromys* seems to be entirely arboreal. One individual, however, was killed on the ground at night by dogs. A strong wind had been blowing, and many trees and large limbs had fallen earlier in the night. Perhaps the wooly opossum had fallen with a tree or branch or perhaps it had been snatched from a low branch by one of the dogs.

No homes of wooly opossums were found. Twenty kilometers east of Jesús Carranza, at 300 feet elevation, on February 6, 1948, a pack of dogs began to sniff and bark at the foot of a large mango tree. A few moments later a wooly opossum was seen in the tree approximately 20 feet from the ground. The mango tree had several hollows in the trunk immediately below the place where the animal was first seen and the opossum probably was sleeping in one of these when scented by the dogs.

This seems to be the rarest species of marsupial occurring in Veracruz. Hundreds of hours were spent in hunting with headlights in the Veracruz jungles, and several nights were spent at the type locality of *Caluromys d. aztecus* where we searched especially for wooly opossums. In spite of this, only a few specimens were collected in the four seasons of field work. It is significant also that the native hunters did not recognize the few specimens that we collected, and had no name for the species.

*Caluromys*, like other marsupials that occur in Veracruz, seems to be solitary. Never was more than one seen at a time, although



on two occasions two individuals were shot from the same tree on the same night, but several hours apart.

In the jungle at night, the eyes of *Caluromys* glow a brilliant red, like the eyes of *Didelphis*. Animals were seen moving rather slowly in the tall jungle trees, or were motionless as they looked at the light. One animal was 35 feet from the ground on the limb of an "amate-capulín" tree, about 10 inches in diameter and another was taken in the same tree, about 50 feet from the ground. One that was shot and wounded, but not killed, moved swiftly. It was not vicious, as is *Philander*, nor dull and slow, like *Didelphis*. The general impression gained was that of an unusually long, slender, squirrellike animal having short legs.

The wooly opossum feeds on the berrylike fruit of the "amate-capulín" tree—a favorite of all fruit-eating birds and mammals. One specimen had the skins of two small, green berrylike fruits in the stomach. One old female was fat, but most of the specimens taken were lean.

At Potrero a wooly opossum was found by workmen in a pile of stored pipes. It was kept as a pet by Miss Marion Forbes of Potrero Viejo. The animal proved to be gentle and affectionate. Its ordinary movements were slow and deliberate, but when frightened it was able to run fairly fast. When running, the rear part of the body was held much higher than the shoulders; the nose almost touched the floor and the tail was held out almost straight. From the tip of the nose to the tip of the tail, the dorsal surface of the opossum formed a straight line at an angle of about 30 degrees with the floor.

This animal was a skillful climber, with a splendid sense of balance. It proved almost impossible to push the animal from the arm of a chair or a similar position; at least one of its feet or the tail would retain a secure grip. The tail of this opossum was one of its most remarkable features; it gripped objects almost as though the tail had an independent nervous system and eyes of its own. Even bas-relief carvings on furniture offered enough of a purchase to assist in supporting the animal. When suspended from the tip of its tail the animal twisted its body up, until it could grip its tail with its hands. It then climbed up, hand over hand, to the support on which the tip of the tail had a purchase.

When asleep the wooly opossum does not curl its body into a tight ball, but lies on its side in a loose semicircle. The tail is placed in one complete circle about the body, and the extreme tip is hooked over the tail about an inch from the base.



This individual was fed bananas, insects and mice. It refused live, adult mice, but ate those freshly killed. Young mice were eaten alive or dead. Live insects, such as large cockroaches, were eaten with every indication of excitement and pleasure. The insect was grasped in the hands and squeezed tightly. It was then usually transferred to the left hand and eaten, a bite at a time. Each bite was thoroughly chewed before another was taken.

The pouch of the wooly opossum is well developed in most females. One had a poorly developed pouch. Three young were found in the pouch of one female. No ectoparasites were found on any of our specimens of *Caluromys*.

#### Order INSECTIVORA

#### Family Soricidae

#### *Sorex vagrans orizabae* Merriam

#### Vagrant Shrew

*Specimen examined.*—Colfre de Perote, 9500 ft., 1 (U. S. N. M.).

Measurements of the adult female from Cofre de Perote, according to Jackson (1928:114), are: 98; 33.5; 13; condylobasal length, 16.5; cranial breadth, 7.8.

#### *Sorex macrodon* Merriam

#### Large-toothed Shrew

*Specimens examined.*—Total 4: Las Vigas, 8500 ft., 3; 3 km. W Acultzingo, 7000 ft., 1.

*Additional records.*—Jackson (1928:153) lists Orizaba and Xico.

So far this species is known only from the four places listed immediately above, all in west-central Veracruz at higher elevations.

The thickened borders of the premaxillae where they border the anterior nares distinguish each of the four skulls from those of the other *Sorex* that are here identified as *Sorex saussurei veraecrucis*.

A male with enlarged testes was captured in an oatmeal-baited trap set in dense, woody bushes along the mossy bank of a tiny stream three kilometers west of Acultzingo in the cloud brushland at the very edge of the Mexican Plateau. At Las Vigas three other males were trapped in runways of *Microtus mexicanus* in deep moss at the bottom of a valley on the northern edge of the town. Two other species of shrews, *Sorex saussurei* and *Cryptotis mexicanus*, were common in the same area.

*Sorex saussurei veraecrucis* Jackson

## Saussure's Shrew

*Specimens examined*.—Total 10: 6 km. SSE Altotonga, 9000 ft., 1; 1 km. W Las Vigas, 8500 ft., 1; Las Vigas, 8500 ft., 7; 2 km. E Las Vigas, 8000 ft., 1. Additional record.—Xico (= type locality).

On November 11, 1946, six kilometers south-southeast of Altotonga a large, adult female was trapped. She was not pregnant and was not nursing, but seemingly had raised a litter that year; the mammae were large. The trap was in a damp swale about 50 meters long by 20 meters wide. There were a few bushes two feet high, but the cover otherwise was grass about 3 inches high, low ferns, bracken, moss, and liverworts. The swale drained into a deep arroyo with mossy rocks and a cold, clear stream. Along the border of a cornfield only a few yards from where the shrew was caught, *Peromyscus melanotis* was trapped. In the arroyo we took only *Peromyscus boylii* and *Microtus mexicanus*. The surrounding area, for miles, is arid pine forest.

At Las Vigas seven specimens were obtained in runways of shrews and of *Microtus mexicanus* in deep, damp moss in a small valley in the pine forest. Three individuals of *Sorex macrodon*, numerous specimens of *Cryptotis mexicanus*, and *Microtus mexicanus* also were taken there. One kilometer west of Las Vigas a specimen was trapped in a small heap of boulders in a fence, or "cerca," of maguey plants. This individual was associated with *Peromyscus melanotis* and *Reithrodontomys megalotis*.

Two kilometers east of Las Vigas a shrew of this species was caught in a trap set in a damp place under a low cliff of lava in the "malpais," an extensive, recent flow of lava. *Peromyscus boylii* and *Neotoma mexicana torquata* were common there.

*Cryptotis mexicana mexicana* (Coues)

## Mexican Small-eared Shrew

*Specimens examined*.—Total 54: 4 km. W Tlapacoyan, 1700 ft., 3; 1 km. W Las Vigas, 8500 ft., 1; Las Vigas, 8500 ft., 44; Huatusco, 5000 ft., 3; Coscomatepec, 5000, ft., 3.

Additional records (Merriam, 1895:23).—Jalapa, type locality; Jico; Orizaba.

This shrew occupies a limited area in the state of Veracruz, but locally is abundant in favorable habitat.

On November 21, 1947, a dead individual was found in a trail four kilometers west of Tlapacoyan. Although much decayed, it was

prepared as a specimen. The following night two others were taken in a line of mousetraps set in beds of six-inch high succulent vegetation along a small stream. The soil was soft and wet. There were numerous runways of small mammals, probably of *Microtus quasiater*. The traps along the streams took also *Microtus quasiater*, *Oryzomys palustris*, *Oryzomys alfaroi* and *Marmosa mexicana*.

At Las Vigas several individuals of *Cryptotis mexicana* were trapped along the long hedges of maguey plants, called "cercas," that separate the cornfields in this area. Here the shrew was associated with *Microtus mexicanus*, *Peromyscus melanotis* and *Reithrodontomys megalotis*. Many other individuals of *C. mexicana* were taken in the deep moss in a small, cold valley in the pine forest nearby. *Sorex macrodon*, *Sorex saussurei* and *Microtus mexicanus* were also found here, although the *Cryptotis* outnumbered the two species of *Sorex* together by ten to one.

At Huatusco, specimens were taken in a patch of wild bananas about 30 feet in length by 20 feet in width. At Coscomatepec, specimens were taken in dense, dry brush on an overgrown hillside.

We regularly trapped specimens of this species by using banana, peanut and walnut for bait. The stomachs of specimens examined in the field, however, contained remains of only insects and worms, as far as could be determined.

Several females taken at Las Vigas, between October 7 and 20, 1948, were nursing young. Other females were neither nursing nor pregnant. No females containing embryos were taken at that locality. One taken at Coscomatepec, 5000 feet elevation, contained three embryos, each five millimeters long, on December 2, 1948.

### ***Cryptotis nelsoni* (Merriam)**

#### Nelson's Small-eared Shrew

Record.—The type locality, Volcán San Martín Tuxtla (Merriam, 1895:26).

This shrew is known only from the type locality and may be only sub-specifically separable from *Cryptotis mexicana*.

### ***Cryptotis obscura* (Merriam)**

#### Dusky Small-eared Shrew

*Specimen examined*.—Zacualpan, 6000 ft., 1. The identification is tentative (specimens that might be useful in direct comparison are on loan to a prospective revisor of the genus, April 5, 1961). M. R. Lee, the collector, trapped the specimen near "a large deciduous tree among a mat of fallen leaves."

*Cryptotis micrura* (Tomes)

## Guatemalan Small-eared Shrew

*Specimens examined*.—Total 11: 7 km. W El Brinco, 800 ft., 1; Las Vigas, 8500 ft., 2; 5 km. N Jalapa, 4500 ft., 1; 7 km. NNW Cerro Gordo, 3; Teocelo, 4500 ft., 3; 1 km. E Mecayucan, 200 ft., 1.

Additional records (Merriam, 1895:22, unless otherwise noted).—Jico; Boca del Río (Findley, 1955:615); Orizaba Valley; Catemaco.

Our specimens of *C. micrura* differ from those of *C. parva berlandieri* principally in darker pelage and larger skull, in which the top of the braincase, relative to the rostrum, is more elevated. Cranial measurements of eight of these specimens have been published by Findley (1955:616). When the species of the genus *Cryptotis* are revised we suppose that *C. micrura* will be arranged as a subspecies of *C. parva*.

This tiny shrew is the smallest mammal that occurs in the state of Veracruz. It is rare, and of rather erratic distribution through the Tropical Life-zone of the state. Little was learned of its habits.

A *Cryptotis micrura*, captured by hand five kilometers north of Jalapa, on October 29, 1946, was under a pile of rock, 30 feet long and 10 feet wide, in one of many trough-shaped runways that probably had been constructed by *Microtus quasiater*. These mice were abundant in the vicinity. The rocks were one to three feet in diameter and of irregular shape. The rock pile was in a grassy meadow that stretched away for 75 feet or more in every direction; cattle had grazed the grass here until it was only about three inches high.

Seven kilometers north-northwest of Cerro Gordo, at 1500 feet elevation, on October 28, 1947, 50 traps, set in low, thick, damp brush, took one shrew, along with *Reithrodontomys fulvescens* (5 individuals), *Peromyscus mexicanus* (1), *Sigmodon hispidus* (5), and *Baiomys musculus* (7). The shrew had no parasites. It was a female that had recently been nursing young. On October 29 another specimen was taken in the same area. On November 26, we returned to the same locality, and took a non-pregnant female in dense sawgrass. On the preceding night our traps had been set in the dense brush where two shrews were taken a month ago. The area had dried up and then had become wet again with the onset of the Norte Season. On the morning of the 26th our traps held only two individuals of *Baiomys* and a few individuals of *Sigmodon*. We immediately moved our traps to dense grass about three feet high (the flower stalks were six feet high) and set them in sheltered

places to protect them from the rain. Sometimes we made a thatched roof over the trap site. We left the traps out all day, and took nine cotton rats. In the night the traps took *Cryptotis* (1), *Reithrodontomys* (3), and *Sigmodon* (3).

At Teocelo, along a low rock wall that was overgrown with brush and grasses and that served to separate two coffee groves, a shrew of this species was trapped on January 3, and another on January 7, 1949. *Reithrodontomys* and *Microtus quasiater* were common here.

On November 11, 1948, a *Cryptotis micrura* was obtained in a patch of elephant's ear and other succulent vegetation beside a small stream, seven kilometers west of El Brinco. It was associated with *Peromyscus leucopus* and *Peromyscus mexicanus*.

One kilometer east of Mecayucan, on December 19, 1947, a young *Cryptotis micrura* was taken on dry, hard ground beneath thorny bushes. The surface of the ground had some sparse grass and dry leaves but was mostly bare. This locality is on the arid coastal plain.

A skull of *Cryptotis micrura* was removed from the intestinal tract of a king snake (*Lampropeltis polyzona*) at Potrero Viejo, 1700 feet elevation, by Dr. E. H. Taylor in 1936.

## Order CHIROPTERA

### Family Emballonuridae

#### *Rhynchonycteris naso* (Wied-Neuwied)

#### Brazilian Long-nosed Bat

*Specimens examined*.—Total 59: 5 km. SW Boca del Río, 10 ft., 1; 1 km. E Mecayucan, 200 ft., 5; Río Blanco, 20 km. W Piedras Negras, 400 ft., 17; 15 km. W Piedras Negras, 300 ft., 6; 14 km. SW Coatzacoalcos, 100 ft., 16; 22 km. ESE Jesús Carranza, 300 ft., 4; 35 km. SE Jesús Carranza, 350 ft., 10.

Locally this species is abundant in the state of Veracruz, although its distribution is rather irregular. At times, none is found along miles of river in seemingly suitable habitat. Then a half dozen colonies may be found within the space of a mile. The following notes record typical finds of this bat.

"This afternoon Gerardo, Vicente, two other men, and I took a dugout canoe and went hunting for these small bats in the arroyo [an arroyo leading into the Río Blanco, 20 kilometers west of Piedras Negras, on October 4, 1946]. We paddled up the vine-hung stream, passing under many logs that lay across our path. Each log was carefully examined, and also the trees along the bank. We came upon a colony unexpectedly, and a swarm of mothlike flying bats, about 25 in all, went flitting upstream. At the next leaning tree about 15 had landed. They were spaced one to two



inches apart in a vertical line on the under side of the tree. The lowest was about five inches from the water. My shot brought down four, and the group broke up, some flying downstream and others up. We followed them, and found them at odd places along the shore or on dead, leaning trees in the water. All were over water, and every one shot fell into the stream. After the first shot, I got no more chances at bunches. The bats were scattered singly or in groups of up to four. They usually allowed a fairly close approach. Many times we were within 10 feet of them before they flew. So well did the dull, grayish color with the four paler spots match lichens or mouldy spots on trees, that we often failed to see them." Of the 13 collected at this place, two are small and, as shown by the development of the skull, are young of the year. Of the seven adult females, none was pregnant but all had active mammary glands. The testes of the adult males were small.

A colony found on the north side of the Río Coatzacoalcos, 14 kilometers southwest of the city of Coatzacoalcos, on February 2, 1947, was described as follows: "The slow-moving rivers and streams of this area seem to be ideal for sharp-nosed bats, and we found them after a short search. We hunted them from a dugout canoe, looking carefully on the undersides of leaning tree trunks in the water and on the bank. One specimen, a male, was found singly. At another tree, on the bank but overhanging the stream, we saw a line of about 15. They were in a vertical line, along the lowest part of the circumference of the tree, which was about two and one half feet thick. The lowest bat was about two feet from the water—the highest about four and one half feet. I fired at the center of the line, getting eight specimens. The others flew upstream but we did not try to follow them. Five (of those taken) are non-pregnant females. The testes of the four males are small."

At the same locality, on February 7, 1947: "Yesterday afternoon we were poling a dugout along an arroyo of still water choked with water hyacinth, when a swarm of sharp-nosed bats came out from the underside of a dead tree lying across the arroyo. The underside of the tree was about two feet from the surface. There were about 50 bats in the group. Many lit on the underside of a similar tree, 75 feet on up the arroyo. We brought down 11 in one shot.

"The series includes six females and five males. The testes of the males vary from two by two to three by three millimeters in diameter. The testes are almost round. All the females were preg-

nant, with embryos (one each) from nine to ten millimeters in length."

The evening flight of this bat is mothlike, and the species can be recognized when the bats are in flight. They seem never to fly anywhere except over water. They fly rather slowly, in relatively straight lines, and usually from one to three feet above the surface of the water.

Like many other species of bats, the sharp-nosed bat retires to a convenient roost after the evening hunt. Surprisingly, the one night roost found was not over water. It was one kilometer east of Mecayucan. On September 20, 1947, it was described as follows: "Tonight I looked for bats under the bridge across the arroyo here. I saw nothing but what I took to be three big cockroaches, sticking flat to the concrete 30 feet over my head. Farther on, where the ground sloped up, was another. This I examined closely, and it was one of the large cockroaches. While passing under the others a few minutes later, I heard a bat flutter, and turned out my light. It seemed to alight over my head. When I turned my light on there were four cockroaches where, a moment before there had been three. They still looked like cockroaches, even having back legs, but with the light close to my eyes I could see four pairs of tiny red eyes. I felt almost foolish shooting at them, but with my shot a bat of this species fell. The others did not move (as I shot them all, one by one). By going along under the bridge I got another. One shot did drop a cockroach." The resemblance of these bats to cockroaches was remarkable. They stuck flat against the concrete. Their reversed wing tips lay back away from the body at a 30 degree angle, like the back legs of the big "queen" cockroaches. Their mottled bodies are similar in color.

Pregnant females of this species were taken on January 13 and February 7. When these bats are carrying young, they desert their roosts over water and retire to hollow trees. Thirty-five kilometers southeast of Jesús Carranza, on April 9, 1949, several were shot from colonies roosting on a cliff overhanging the Río Solosuchil. All were males. Later that same day, the hollow shell of a tree, lying on the ground in the shade of a deep arroyo, was broken open. A number of bats flew out. Eight were captured. Each was a female of *Rhynchonycteris*, having a single large young clinging to a nipple. Some of the young were so large that the females were unable to fly more than a few yards.

*Saccopteryx bilineata* (Temminck)

## Greater White-lined Bat

*Specimens examined*.—Total 54: Boca del Río, 10 ft., 2; Río Blanco, 20 km. W Piedras Negras, 400 ft., 1; 2 km. N Motzorongo, 1500 ft., 2; 14 km. SW Coatzacoalcos, 100 ft., 6; 35 km. ENE Jesús Carranza, 150 ft., 1; 20 km. ENE Jesús Carranza, 200 ft., 8; 20 km. E Jesús Carranza, 300 ft., 10; 25 km. SE Jesús Carranza, 250 ft., 7; 20 km. S Jesús Carranza, 300 ft., 10; 34 km. SE Jesús Carranza, 400 ft., 1; 35 km. SE Jesús Carranza, 350-400 ft., 3; 38 km. SE Jesús Carranza, 500 ft., 2.

Additional records (Sanborn, 1937:330).—Veracruz; Achotal; Minatitlan.

The greater white-lined bat is abundant in the dense jungle of the southern part of Veracruz but is far less common farther north, in the central part of the state.

On the south side of the Río Blanco, 20 kilometers west of Piedras Negras, on October 1, 1946, a bat of this species was shot in flight. This area is part of the almost level coastal plain, forested only along water courses. The bat was flying about under the shade of a large mango tree along an arroyo. No other individuals were taken on the coastal plane, except at Boca del Río, 10 feet elevation, where two were found clinging to the side of a horizontal beam, 25 feet from the ground, in the ruins of an old building.

In the upper humid division of the Tropical Life-zone I found this species at only one locality. This was two kilometers north of Motzorongo. There two were shot as they hunted over the surface of a small pond in an arroyo. Nowhere else in Veracruz was this bat found at an elevation so high as 1500 feet.

Many daytime retreats of this species of bat were found in southern Veracruz. Almost all were in hollow trees; some were in shaded but well-lighted hollows and others in almost complete darkness. Some typical retreats were noted as follows:

On February 6, 1947, 14 kilometers southwest of Coatzacoalcos while searching for hollow trees in the dense jungle for topotypes of *Vampyrum spectrum*, we came across a colony of about 25 individuals of this bat (*Saccopteryx*) in a hollow tree, really just the shell of a tree, about three feet in diameter. The hollow was open on top and along one side. It was so light there that the bats were easily visible. They were not shy and I was able to catch four with my hands before the others took flight. They came back within five minutes, but this time were too shy to catch by hand. I shot three, but one was too smashed to save.

Twenty kilometers east of Jesús Carranza on February 7, 1948, we "Went hunting for bats in hollow trees. . . . A colony of seven of this species was found in a shell-like fig tree. The tree was about seven feet in diameter with a five-foot hollow that went up at least 40 feet. There were numerous large openings and the hollow was as light as day. The bats were scattered, clinging to the inside of the shell of the tree, 15 to 20 feet from the ground. All seven were taken—six females and one male. A single *Saccopteryx* was found in a small cavity no higher than my head, in a tall tree about 500 yards away. This cavity was rather dark."

At the same locality on February 7, 1948, "A few bats of this species, and about 20 *Desmodus*, were found in a large hollow tree . . . probably 20 feet in diameter at the base, and . . . isolated in a forest of palms that effectively shade it. The opening to the hollow is a narrow V, six feet high by three wide at its widest. I fired nine shots from my pistol into the hollow and one *Saccopteryx* and four vampires fell down. There were many other bats in the hole, but without my light I could do nothing."

Thirty-five kilometers southeast of Jesús Carranza three individuals of this bat were noted clinging to the back of a shaded aperture in the face of a limestone cliff. They were approximately 25 feet from the ground.

Most of the specimens of this species are females. Adult females with embryos were found only once, on February 18, 1948, when the two adults taken each had a single small embryo. The only parasites noted on *Saccopteryx bilineata* were small, red mites. Most of the specimens collected had a few such mites on the ears.

The flight of *Saccopteryx bilineata* closely resembles that of *Myotis* but is slower and more deliberate. Bats of this species usually fly only four to seven feet above the ground along water courses, trails or openings in the jungle, but once, specimens were shot while they were flying over the tops of small trees, fully 30 feet from the ground. They fly rather erratically, as they swerve and swoop in catching insects. They prefer to remain under the shade and cover of trees and branches while in flight. They emerge shortly after sunset, but while it is still almost daylight, and each individual seems to patrol a certain part of the jungle that I suppose is its home range or hunting ground.

### ***Peropteryx macrotis macrotis* (Wagner)**

#### Lesser Doglike Bat

*Specimens examined.*—Total 15: 35 km. SE Jesús Carranza, 350 ft., 2; 38 km. SE Jesús Carranza, 500 ft., 13.

All of our specimens of this species were captured in caves in the limestone cliffs along the Río Chalchijapa, 35 to 38 kilometers southeast of Jesús Carranza.

The species was first found on April 27, 1948, when a colony was located in a shallow recess in a cliff. This recess was about four feet high, 50 feet long and 20 feet deep. The opening was flush with the face of the cliff and about 20 feet above the surface of the river. The bats were clinging to the roof of the recess, in shaded daylight. When frightened they took refuge in a small, roomlike cave about six feet high and 20 feet in diameter. The entrance to this cave was about 20 inches in diameter and the cave was dark. The bats were captured in a net hung over the entrance to the cave. One bat escaped and 10 were captured. On April 30 the cave was revisited and two more individuals were captured. In April, 1949, there were no bats of any kind in this cave.

On April 27, 1948, a specimen was taken in a long, tubelike cave about three feet in diameter and 100 feet long. An *Artibeus jamaicensis* was also found in the cave. The following day two others were taken in small caves in a limestone cliff. One bat was alone. The other was in a cave with several individuals of *Balantiopteryx io* and a *Chropterus auritus*.

In April, 1949, the caves on the Chalchijapa were revisited. All the caves where *Peropteryx macrotis* had been found in 1948 were examined but only two bats of this species were taken.

### *Peropteryx kappleri kappleri* Peters

#### Greater Doglike Bat

*Specimens examined*.—Four from 38 km. SE Jesús Carranza, 500 ft.

The four specimens were obtained on April 30, 1948, and were seen first as they flew from the underside of a large block of limestone that had fallen long before from a high cliff. The underside of this block was shaded but not dark. Two of the bats were captured when they entered a small cave formed by fallen boulders. The cave was rather dark, and approximately seven feet in diameter by 10 feet in height. The two remaining bats flew to a similar but smaller cave 30 feet away where they too were caught. All four were males having small testes. The flight of these bats was slow and deliberate. One was captured in full flight with a quick snatch of a hand.



**Centronycteris maximiliani centralis** Thomas

## Thomas' Bat

*Specimen examined.*—One from 35 km. SE Jesús Carranza, 350 ft.

This rare bat is known from but seven specimens. Ours was shot in late afternoon while it was flying in dense jungle. The bat was about 10 feet from the ground and was following a regular course approximately 125 feet in length. At each end of its course, in approximately 10 trips up and down a small arroyo, the bat turned each time at almost exactly the same place. The flight was slow and fluttery.

**Balantiopteryx plicata plicata** Peters

## Peters' Bat

*Specimens examined.*—Total 25: Puente Nacional, 500-1000 ft., 17; 9 km. E. Totutla, 2500 ft., 3; 7 km. SE San Juan de la Punta, 400 ft., 5.

These little bluish bats seem to prefer an arid habitat. On October 21 and 22, 1946, at Puente Nacional several colonies, numbering from two to 75 individuals, were in narrow, horizontal, slitlike caves, formed along the contact of a layer of soft conglomerate rock with a layer of hard sandstone. The bats were clinging to the ceiling of the cave with both feet and the thumbs, with bodies thrust out, away from the rock. The cave was light enough for a person to see the bats without the aid of an artificial light. When disturbed, they flew farther back into the cave. In the beam of a flashlight, their eyes gleamed like tiny rubies, far back in the low cave.

Near these caves, where the bats were resting by day, were several larger, more open caves. The floors of these were covered to a depth of six inches with guano. Seemingly the bats hung up at night in these larger caves, to rest after hunting.

Nine kilometers east of Totutla several bats of this species were found in a large, dry cave, along with several individuals of *Micronycteris sylvestris*. The three specimens taken were males. On December 15, 1946, seven kilometers southeast of San Juan de la Punta, a colony of about 200 bluish sac-winged bats and a few more than 50 common vampires, species *Desmodus rotundus*, were in a small, dark cave along the Río Blanco. The sac-winged bats were shy, and quick to take alarm.

Few females of *B. plicata* were found and none taken was pregnant. This species of bat is more often than not parasitized by a small orange or yellow mite. These mites live in clumps of from 15 to 30 or more on the ears and, less commonly, on the tail or antebrachial membranes.

**Balantiopteryx io** Thomas

## Thomas' Sac-winged Bat

*Specimens examined*.—Total 107: Grutas Atoyac, 2 km. E Atoyac, 14; 5 km. S Potrero, 1700 ft., 11; 38 km. SE Jesús Carranza, 500 ft., 82.

We first found this species on March 6, 1946, in a cave known as Grutas Atoyac, two kilometers east of Atoyac, at about 1500 feet elevation. Approximately 25 individuals were in the innermost rooms of the cave, fully 300 meters from its mouth. The bats were hanging separately, most of them in small, pitlike depressions in the roof. A few hung from the walls. A few vampires (*Desmodus rotundus*) were in the same cave, but near its mouth. The 14 individuals of *Balantiopteryx io* were evenly divided as to sex. None of the females was pregnant. Each bat had from six to 10 small red mites attached to the membranes of the tail, wings and/or ears.

On April 25, 1948, in a large cave in a limestone cliff, 38 kilometers southeast of Jesús Carranza, along the Río Chalhijapa, this species was abundant. The mouth of the cave is about 30 feet high, 45 feet wide, 20 feet above the river, and the bottom of the entrance is seven feet below the base of the cliff. Inside, the cave varies from 20 to 50 feet in height and 30 to 60 feet in width. The main cave is about 500 feet in length, and there is a side passage about 75 feet long. In addition to *Balantiopteryx io*, *Pteronotus parnellii*, *Artibeus jamaicensis* and *Myotis nigricans* inhabited the cave.

Some individuals of *B. io* hung from openings in masses of wave-like stalactites 30 to 50 feet from the mouth of the cave, where there was daylight enough to permit a person to see the bats. They were about 20 feet from the floor. Approximately 75 feet from its mouth, the cave varies from 25 to 50 feet in height, and the bats were most abundant there. Most were hanging 25 to 35 feet from the floor, but some were as high as the cave extended. Only a few were seen as far as 100 feet from the mouth of the cave, and only one was noted more than 125 feet from the mouth. Without exception the bats hung singly, and usually more than nine inches from one another. They preferred to hang from the tops of pits and crevices but some hung from the open, flat ceiling. It was estimated that between 500 and 1000 individuals of *Balantiopteryx* were present in the cave. For so many bats, the quantity of guano in the cave was surprisingly small.

In addition to the large colony mentioned above, more than 1000 other individuals of *Balantiopteryx io* were seen at this locality. Most were in some of the thousands of small caves that pit the cliffs,

but many were in deep, dark crevices and masses of stalactites that hung from the faces of the cliffs. A total of 89 specimens was saved from this locality, in 1948; only two were females. At the same locality in 1949, the bats were as abundant as the year before.

Two females taken on April 25, 1948, contained embryos.

Family Phyllostomidae

*Pteronotus psilotis* (Dobson)

Dobson's Mustached Bat

*Specimens examined*.—Seventy-five from 3 km. E San Andrés Tuxtla, 1000 ft.

*Additional record*.—Near Tuxpan (Malaga-Alba and Villa R., 1957:534).

For this species, long known as *Chilonycteris psilotis*, the older generic name *Pteronotus* is here used because Burt and Stirton (1961:24) regard all of the species heretofore referred to *Chilonycteris* and to *Pteronotus* as congeneric.

In early January, 1948, a large colony of this species was found along with other kinds of bats three kilometers east of San Andrés Tuxtla in a long, narrow, sinuous cave in a basaltic cliff. The entrance to the cave was triangular, about two meters on a side. The cave consisted of a tubelike lower portion about 200 feet long, abruptly blocked by a wall of rock, which probably resulted from a geologic fault. Ten feet above the lower level of the cave, a narrow opening allows entrance to the upper part of the cave, consisting of a series of low, shallow rooms, joined by passages.

The lower level was cool and relatively dry. There we caught *Pteronotus parnellii*, *Glossophaga soricina*, *Carollia perspicillata*, *Desmodus rotundus* and *Natalus stramineus*. The only odor noted in the lower level of the cave was the ammonia smell of the vampire bats.

The upper part of the cave, in strong contrast to the lower part, was hot and damp, with an almost overpowering stench. The temperature was estimated at 95 degrees Fahrenheit. The walls in many places were wet; drops of water hung from the roof before dropping to the floor. The floor was buried under many inches of semi-liquid bat guano, and the surface of the guano was so covered with the white larvae of a small species of fly that it appeared to have been whitewashed. The air of the cave contained millions of tiny black flies. In this upper level there were a few individuals of *Mormoops megalophylla* and thousands of individuals of *Pteronotus psilotis* and *Pteronotus davyi*.

*Pteronotus psilotis* was a weaker flier than *Pteronotus davyi*; a net that was hung in the cave took several specimens of *P. psilotis*

but no *P. davyi*. *P. psilotis* was notably less agile in flight than *P. davyi*. At rest, *psilotis* preferred to lie on a horizontal or inclined surface; few hung from the roof of the cave. *P. psilotis* was notably swift on the ground, running and hopping with tightly folded wings, and resembled a large spider in motion.

This species is insectivorous. We noted individuals hunting in the evening in openings in the jungle, and among the branches of the tall jungle trees. On one rainy night, many small bats were seen hunting over the surface of a small lake, Laguna Encantada. Two of these were killed and proved to be *P. psilotis*. On later nights, when it was not raining, no bats were seen over the lake.

Like many other species of bats, Dobson's mustached bat seems to fill its stomach quickly, and then to retire to some secluded place to rest. On one dark night, we spent some time in the cave mentioned above. A constant stream of bats was entering and another leaving the cave. With lights turned out, we stood by the side of the cave with small hand nets. When the bats began to pass, the net would be swung, and bats usually were captured. Then the lights would be turned on, and the captives were placed in a sack. The lights caused the bats to withdraw to the mouth of the cave, but shortly after the lights were turned out, the bats again began to stream past. In this fashion we captured *Pteronotus psilotis* (56), *Pteronotus davyi* (6), *Carollia* (1), and *Natalus* (1).

None of the females of this species taken in the first week of January was pregnant. There was an average of about four parasitic winged flies and three large black "stick-tight" fleas to each bat of this species that we examined.

### *Pteronotus parnellii mexicana* (Miller)

#### Parnell's Mustached Bat

*Specimens examined*.—Total 7: 8 km. NW Potrero, 1700 ft., 1; 3 km. E San Andrés Tuxtla, 1000 ft., 2; 38 km. SE Jesús Carranza, 500 ft., 4.

*Additional records*.—Jalapa (Ward, 1904:639); Mirador (Rehn, 1904:204).

For this species, long known as *Chilonycteris parnellii*, the older generic name *Pteronotus* is here used because Burt and Stirton (1961:24) regard all of the species heretofore referred to *Chilonycteris* and to *Pteronotus* as congeneric.

This species seems to be rather rare in the State of Veracruz. Our specimens were all captured in caves surrounded by dense jungle. In a lava cave three kilometers east of San Andrés Tuxtla (see account of *Pteronotus psilotis*), two specimens of this bat were obtained by firing a pistol loaded with dust-shot into a wheeling mass

of flying bats, that consisted principally of *Natalus stramineus* and *Glossophaga soricina*. This cave was searched on many occasions for other individuals of this species, but none was found.

In April, 1948, 38 kilometers southeast of Jesús Carranza, this species was found in a large limestone cave (see account of *Balantiopteryx io*). In this cave, from 75 to 150 feet from the entrance, there were six to eight colonies of *Myotis nigricans*, each colony consisting of a dense mass of from 50 to 150 pregnant females. Each of four colonies had a single *Pteronotus parnellii*, a nonpregnant female, packed tightly in with the mass of *Myotis*. The ground beneath each colony was examined, but nothing was found to support our suspicion that *P. parnellii* was preying on the *Myotis*, or in some fashion obtaining benefit from the association. On November 18, 1948, eight kilometers northwest of Potrero, an adult male *P. parnellii* was creeping about and over approximately 50 individuals of *Artibeus jamaicensis* that clung in a tight mass to the top of a small pit in the roof of a limestone cave.

### *Pteronotus davyi fulvus* (Thomas)

#### Davy's Naked-backed Bat

*Specimens examined*.—Sixty-two from 3 km. E San Andrés Tuxtla, 1000 ft.

*Additional records* (Davis and Russell, 1952:235).—Mirador; San Andrés Tuxtla; South San Andrés Tuxtla; Achotal.

In Veracruz we found this species only in a cliff of basaltic rock (see account of *Pteronotus psilotis*) three kilometers east of San Andrés Tuxtla in the first week of January, 1948. On the ground, *Pteronotus davyi* acts much like *Pteronotus psilotis*, running and hopping with considerable agility, with wings tightly folded to the body, but in the air, *P. davyi* is far more skillful than *P. psilotis* and was far more difficult to capture in a butterfly net; also, *P. davyi* did not become entangled in the strands of a large hanging net. Like *P. psilotis*, *P. davyi* retires to a cave or similar retreat after its evening hunt. Swinging a net blindly at bats passing in the darkness yielded 56 individuals of *P. psilotis* as against six of *P. davyi*. Probably fewer specimens of *P. davyi* were taken because it could more often dodge the net; shooting blindly in places where both species were living brought down the two kinds in about equal numbers.

In the early evening, individuals of *Pteronotus davyi* emerged from the cave and began their evening hunt. Although they deviated much from a straight line of flight when hunting insects, their flight was rather slow and direct in comparison with that of other



bats of about the same size. Most individuals of *P. davyi* flew only about seven feet from the ground, although some barely skimmed the ground and a few maintained an altitude of 25 feet or more. The line of flight of the bats from the mouth of the cave was consistently down the face of the cliff, through the jungle, across a small bay of the lake, over a meadow of tall sawgrass, and up a steep hillside, to the open, grassy hills. A few individuals drank water as they passed the lake, but most did not. Probably the flight broke up over the hills, but this could not be determined for it was usually too dark to watch the bats after they were followed to the hills. This flight was repeated night after night. The first bats reached the top of the hill, where we were camped, at dusk. This was about one kilometer from the cave. The flight continued for nearly an hour.

None of the females of *Pteronotus davyi* collected in the first week of January was pregnant. The testes of the numerous males collected were all small. Males outnumber females in our series by more than three to one. Our *Pteronotus davyi* had relatively few parasites. Most individuals had one small winged-fly or two such but many had none. No "stick-tight" fleas were noted, although these were common on the *Pteronotus psilotis* from the same cave.

### *Mormoops megalophylla megalophylla* (Peters)

#### Peter's Leaf-chinned Bat

*Specimens examined*.—Total 6: 6 km. WSW Boca del Río, 10 ft., 1; 4 km. WNW Fortín, 3200 ft., 1; 3 km. E San Andrés Tuxtla, 1000 ft., 4.

*Additional records*.—Cañon of Actopan NE of Jalapa (Ward, 1904:634); Mirador (Rehn, 1902:170); Orizaba (Rehn, 1902:170).

Hall and Kelson (1959:96) list, under *M. m. megalophylla*, specimens recorded by Ward (1904:634) from the Cañon of Actopan and incorrectly plot the locality too far south. As clearly stated by Ward, the locality is "some miles northeast of Jalapa, Veracruz, in the bottom of the Cañon of Actopan." Therefore, the place is correctly to be plotted at the north margin of the black dot representing Mirador on Map 59, page 96 (Hall and Kelson, 1959).

Two subspecies of this bat, *Mormoops megalophylla megalophylla* (Peters) and *Mormoops megalophylla senicula* (Rehn), have been reported from Veracruz. They were originally described as being separable primarily on the basis of the structure of the second upper premolar (Rehn, 1902:169). In 1960, specimens, from northern and southern extremes of the range of the species, in the Museum of Natural History of the University of Kansas, were examined as to this dental character and other characters. Also, six specimens of *Mormoops megalophylla* from Coahuila, six from Guatemala, and one from Tabasco were examined. The structure of P2 did not serve to dis-

tinguish between these specimens by the methods employed. Villa and Jiménez by independent study later (1961:502) reported the same conclusion. But, in 1960, other differences in other parts of the specimens influenced us to recognize two subspecies. The pelage of the northern specimens was dull brown and they were more densely haired than the Guatemalan and Tabascan specimens. Mean length of the forearm on the dried skins was 55.1 mm. The color fitted the description given by Rehn (*op. cit.*) for *M. m. senicula*, including the "silvery suffusion." The Guatemalan and Tabascan specimens differed in color, from other specimens examined, primarily in that the hairs were ochraceous basally—as described by Rehn (*op. cit.*) for *M. m. megalophylla*. The hair was sparse to almost absent on the nape and crown allowing the color of the basal part of the hair to show at the edge of the "naked" area. The mean lengths of the forearms of the Guatemalan specimens and the Tabascan specimen were 54.4 and 54.7, respectively.

Subsequently, Davis and Carter studied a large number of specimens from north of Colombia. Although they noted (1962:65) the difference in color between specimens from Guatemala (chocolate brown) and specimens north thereof (wood brown), they agreed with Villa and Jiménez (1961:502) that *M. m. senicula* should be placed as a synonym of *M. m. megalophylla*. Because the study by Villa and Jiménez was based on a larger number of specimens than we had and because the study by Davis and Carter was of wider geographic scope than our study in 1960 we follow those four authors and apply the subspecific name *M. m. megalophylla* to all of our specimens from the state of Veracruz instead of recognizing the subspecific name *M. m. senicula* and applying it to specimens from Orizaba and others north thereof.

On March 25, 1946, four kilometers west-northwest of Fortín in the tropical-forest habitat, a dead, non-pregnant female was hanging head-down from a window screen. The cause of death could not be ascertained.

In a cave, described in the account of *Pteronotus psilotis*, three kilometers east of San Andrés Tuxtla in early January, 1948, four individuals were obtained in a low, shallow room in the upper level of the cave, where the temperature was estimated to be about 95 degrees Fahrenheit, and where the walls were not wet, and where the odor of the guano was almost overpowering. One was shot in flight among several thousand individuals of *Pteronotus psilotis* and *Pteronotus davyi*. One was asleep, hanging head-down from a rock wall, with its head bent under, almost to the chest, and the back somewhat bowed. The other two were awake, hanging from vertical walls of rock; they twisted about, watching the light, but did not attempt to fly. They squeaked when plucked from the wall.

In contrast to these occurrences, all in the upper humid division of the Tropical Life-zone, one was taken on the arid coastal plain at Boca del Río on April 23, 1949. The female at Boca del Río was hanging free, from the rough surface of an overhead joist in a fairly light room of an abandoned hacienda. In adjoining rooms

there were colonies of *Artibeus jamaicensis* and *Desmodus rotundus*. On other visits to this old building, a small colony of *Glossophaga soricina* was found hanging from the beam where the *Mormoops* was taken, but none was noted on the day that the *Mormoops* was found.

A female taken in early January was not pregnant, nor was a female taken in March. The one taken on April 23, 1949, contained an embryo 22 millimeters long. Two males taken in January had small testes. No parasites were ever noted on this species.

### *Micronycteris megalotis mexicana* Miller

#### Brazilian Small-eared Bat

*Specimens examined*.—Total 16: Plan del Río, 1000 ft., 2; 4 km. W Paso de San Juan, 250 ft., 5; 14 km. SW Coatzacoalcos, 100 ft. 3; Achotal, 5 (Chicago N. H. Mus.); 35 km. SE Jesús Carranza, 400 ft., 1.

Additional record.—Cuesta de Don Lino, near Jalapa (Ward, 1904:653).

This species was found on the arid, open coastal plain of the central part of the state of Veracruz, and in the dense jungles of the southern part of the state. Suitable daytime retreats, rather than surrounding environments, seem to regulate the distribution of *Micronycteris megalotis*. As noted in Veracruz, and elsewhere in Mexico, bats of this species require narrow, dimly-lighted, horizontal, tubular hollows for their daytime retreats. In a natural state these are probably supplied by hollow logs and the burrows of large mammals.

On February 1, 1947, we looked into a large pipe, about two and one half feet in diameter, that passed beneath a railroad embankment, 14 kilometers southwest of Coatzacoalcos. Six bats were in the pipe, but only two, one *Micronycteris* and one *Carollia*, were obtained. On subsequent visits, three more individuals of *Micronycteris* and two more of *Carollia* were taken. Of these three individuals of *Micronycteris* one was found in the pipe after dark. As no bats were found in the pipe earlier that day, it is concluded that *M. megalotis*, like many other bats, retires to a suitable retreat to rest after feeding. The pipe where the bats were found was in dim light.

Four kilometers west of Paso de San Juan on the night of December 15, 1947, a *Micronycteris* was shot in an underpass under the highway from Jalapa to Veracruz. Another bat, probably of this species, was seen in the underpass.

Having become aware of the presence of *Micronycteris* at this locality, we made a systematic search of the pipelike drains that

passed under the highway. Eight bats were found in one drain that was about 18 inches in diameter. Five of these were shot; four were of the species *Micronycteris megalotis* and one was a *Carollia perspicillata*.

Thirty-five kilometers southeast of Jesús Carranza, on February 15, 1948, our dogs had run an agouti to ground in a burrow about 10 inches in diameter. We had enlarged the mouth of the burrow and built a fire of dry palm fronds, forcing smoke into the burrow with a fan. Several small bats suddenly flew out into my face, probably blinded by the smoke. One must always be cautious in opening mammal burrows in the tropics because the dangerous fer-de-lance (*Bothrops atrox*) often lives in burrows of mammals. The sudden appearance of the bats caused me to jump back in alarm. A native assistant knocked one of the bats to the ground and it was a *Micronycteris megalotis*.

Stomachs of specimens taken in the daytime were empty, but stomachs of two shot at night were crammed with remains of insects.

None of the females taken on December 13, December 15, or February 7 was pregnant. The testes of two males taken on December 15 were of moderate size. The individuals from near Coatzacoalcos were parasitized by a few dark-colored, wingless flies.

### *Micronycteris sylvestris* (Thomas)

#### Brown Small-eared Bat

*Specimens examined*.—Total 16: 15 km. ENE Tlacotepec, 1500 ft., 15; 9 km. E Totutla, 2500 ft., 1.

A colony of about 25 bats of this species was found in a cave in a sandstone and conglomerate cliff, 15 kilometers east-northeast of Tlacotepec on December 11, 1947. The cave was low and shallow, about six feet high by 30 feet wide and 30 feet deep, with a low, wide entrance. It was dimly lighted. Thirteen individuals were shot. None of the females taken was pregnant, and the testes of the males were small. All of the bats were parasitized by from three to five small, winged flies.

On December 14, 1948, another bat of this species was taken from a cave in a conglomerate cliff nine kilometers east of Totutla. This cliff was about 300 feet high, and the cave was approximately 50 feet from the top. The entrance was about 30 feet high by 40 feet wide. The cave was of about this dimension, and 75 feet deep. It was well lighted. The only bats present were one *Micronycteris sylvestris* and four individuals of *Balantiopteryx plicata*.



*Mimon cozumelae* Goldman

## Cozumel Spear-nosed Bat

*Specimens examined*.—Total 10: 3 km. N Presidio, 1500 ft., 3; 35 km. SE Jesús Carranza, 350 ft., 4; 38 km. SE Jesús Carranza, 500 ft., 3.

On December 2, 1946, a deep, dark limestone cave, three kilometers north of Presidio, was the home of four of these large, handsome bats. This cave is situated in a small, jungle-covered hill, isolated in an extensive field of sugar cane. The bats were extremely shy, and were in flight when first seen, shortly after we entered the cave. Two escaped from us; the other two were captured.

At the same locality we watched this species feeding, and one was shot in flight. Immediately about our camp were several large trees of sweet oranges. Shortly after dusk the bats would appear from the direction of the hills. They arrived at elevations of from 20 to 35 feet from the ground. They were quite graceful, far more so than *Artibeus*. Their wing-beats were not rapid, and their flight was silent. The long interfemoral membrane could sometimes be seen against the clear sky. They approached the orange trees with a glide and a downward swoop. Numerous traps baited with banana and suspended in the orange trees, or tied to branches, were not disturbed by the bats. We were not able to see them in the trees, in the act of feeding. They ate only very ripe, sometimes spoiled, fruit. Possibly the bats were feeding on insects that were feeding on the fruit. Very ripe fruit was easily dislodged from the trees, and the sound of falling oranges attested to the activities of the bats until almost daybreak.

Two males taken at the above locality were lean, but a female was fat. The only ectoparasite noted was a small, winged fly.

On April 10, 1948, 38 kilometers southeast of Jesús Carranza five large bats were found in a small cave in a limestone bluff. The entrance was a hole a yard in diameter that descended vertically for a distance of 10 feet. The cave itself was about 10 feet high, four feet wide, 15 feet long and the bottom was covered by deep, dark water. A ledge along one wall of the cave allowed entrance. From the roof, three bats were taken. One other escaped out the entrance of the cave, and another was wounded but was lost when it entered a narrow crevice, a foot wide, that led off from one end of the cave. Two of the three bats taken were of the genus *Mimon* and the other a *Trachops cirrhosus*. One *Mimon* was a male and the other a female containing a large embryo. Another female, *Mimon*, with



a full-term embryo, was one of two bats found in a small, room-like cave about 15 feet high and 12 feet in circumference. The bats were in a mass of stalactites in the highest part of the cave. The second bat escaped.

On April 4, 1949, 35 kilometers southeast of Jesús Carranza four individuals of *Mimon* and one *Trachops* were found and captured in a cave about 12 feet across and six feet high. All four were non-pregnant females.

Every cave in which *Mimon* lived was damp; the rock and stalactites were covered with a film of water. Only *Trachops* was found with *Mimon*. These two bats resemble each other closely, and cannot be distinguished in the caves. Both were completely silent. The droppings that littered the floor under their roosts were white, like the droppings of hawks and owls. Both genera are probably somewhat carnivorous.

### *Phyllostomus discolor verrucosus* Elliot

#### Pale Spear-nosed Bat

Record.—Orizaba (Sanborn, 1936:97). The skull shown in figure 67 of Hall and Kelson (1959:108) is not *P. d. verrucosus* but instead is *Trachops cirrhosus coffini*.

### *Trachops cirrhosus coffini* Goldman

#### Fringe-lipped Bat

*Specimens examined*.—Total 17: 38 km. SE Jesús Carranza, 500 ft., 2; 35 km. SE Jesús Carranza, 350 ft., 15.

One of three bats taken from a company of five in a limestone cave 38 kilometers southeast of Jesús Carranza on April 10, 1948, was this species (see account of *Mimon cozumelae*). It was an adult male.

Another was taken at the same locality on April 27 in a long, deep cave in a limestone cliff. About 50 bats, presumably of this species, were present. The cave was so dangerous, because of sink-holes covered with thin ( $\frac{1}{2}$  inch thick) rock, that we were satisfied with one bat, a non-pregnant female. The bats in the cave were in a room entered by a hole descending for 10 feet at a 45 degree angle. The room was about 15 feet long by eight feet wide and seven feet high, but three holes in the floor descended 20 feet or more. A connected passage varied from a slit 10 feet high by six wide, to a hole scarcely large enough to allow a person passage by crawling. The floor was pitted with holes that went down to various depths. The floor was only a thin plate of rock. We went approximately 100

feet into the cave but the bats kept flying ahead of us. On later visits we found no bats in this cave.

On April 5, 1949, a colony of these bats was found 35 kilometers southeast of Jesús Carranza in a cave about 30 feet in length by 20 feet in width and height. The entrance was a small, narrow hole at the base of a limestone cliff. There were no bats in the cave proper but when a stone was dropped into a small hole, about a yard in diameter and four feet deep, we heard the flutter of a bat's wings. At the bottom of the hole, really a pit, a horizontal tube barely large enough to admit a man led off for a distance of about 10 feet. At the end of this tube we entered an almost circular chamber, 15 feet across, having a domed roof about 10 feet high. A female and 13 males of *Trachops* were in the chamber. We captured all 14. The floor was littered with the fecal droppings of this bat; they were white, and resembled the feces of birds more than those of bats. Possibly this species is carnivorous.

### *Chrotopterus auritus auritus* (Peters)

#### Peters' False Vampire Bat

*Specimens examined*.—Three from 38 km. SE Jesús Carranza, 500 ft.

On April 27, 1948, at the mentioned locality, two individuals of this large bat were at the entrance of a short, narrow, high cave. The mouth of the cave is about five feet wide by 35 feet high. The bats were approximately three feet from the entrance, in a hole a foot in diameter and a foot deep, and were slow to fly. A net on the end of a long pole was pushed up to cover the hole, but the bats did not drop into the net until a shot was fired into the roof of the cave near the hole. The testes of the male were of moderate size and the female had a nearly full-term embryo. These large bats did not take flight as soon as did the several individuals of *Artibeus jamaicensis* and *Balantiopteryx io* that also were in the cave. At the same locality on the following day a male of *Chrotopterus*, whose testes were of moderate size, was found in the darkness at the base of a clump of yard-long stalactites at the edge of a cliff. The bat was about 25 feet from the ground. A net at the end of a long pole was placed over the bat, and it dropped into the net.

These bats were free of ectoparasites. White stains beneath the roosts of the bats resembled those left by the excreta of hawks and owls. The stomachs of the specimens were empty. The species is probably carnivorous.

**Vampyrum spectrum nelsoni** (Goldman)

## Linnaeus' False Vampire Bat

Coatzacoalcos (Goldman, 1917:115), the type locality of the subspecies *V. s. nelsoni*, is the one record-station of occurrence in the state. This is the largest North American bat. Selected measurements, in millimeters, of the type are as follows: Total length, 130; length of tail, 0; length of hind foot, 31; height of ear from notch, 40; height of tragus, 12; height of noseleaf, 18; greatest length of skull, 51.0; zygomatic breadth, 23.6.

**Glossophaga soricina leachii** (Gray)

## Pallas' Long-tongued Bat

*Specimens examined*.—Total 152: 35 km. NW Tuxpan, 1000 ft., 6; Potrero [del] Llano, 350 ft., 2; 17 km. NW Tuxpan, 7; Tuxpan, 3; 12½ mi. N Tihuatlan, 300 ft., 6; 10 km. NW Papantla, 750 ft., 1; 3 km. W Gutierrez Zamora [= Gutierrez Zamora], 300 ft., 1; 3 mi. NW Nautla, 3; San Marcos, 200 ft., 3; Plan del Río, 1000 ft., 2; 4 km. W Paso de San Juan, 250 ft., 7; Boca del Río, 10 ft., 20; 8 km. NW Potrero, 1700 ft., 1; 7 km. NW Potrero, 1500 ft., 1; 4 km. WNW Fortín, 3200 ft., 4; Potrero Viejo, 7 km. W. Potrero, 10; 5 km. S Potrero, 1700 ft., 2; Alvarado, 10 ft., 1; 3 km. W Acultzingo, 7000 ft., 1; 3 km. E San Andrés Tuxtla, 1000 ft., 31; Cosamaloapán, 150 ft., 4; Cosamalapan [= Cosamaloapán], 150 ft., 8; 5 mi. S Catemaco, 2; 35 km. ENE Jesús Carranza, 150 ft., 1; Jesús Carranza, 250 ft., 1; 20 km E Jesús Carranza, 300 ft., 6; 33 km. SE Jesús Carranza, 500 ft., 6.

Additional records (Miller, 1913:419, unless otherwise noted).—Mirador; Córdoba (Sumichrast, 1882:202); Catemaco; Jaltipan; Achotal.

This long-tongued bat is fairly common in the lowlands of Veracruz. It makes its home in caves, old buildings, and similar retreats.

Four kilometers west-northwest of Fortín several specimens were taken between March 27 and April 3, 1946, from long, artificial tunnels constructed near the power plant of the Moctezuma Brewery. On the first visit to these tunnels, the bats were abundant; 13 individuals of *Carollia* and one *Glossophaga* were shot. When the tunnels were revisited the following day, the *Carollia* had left, but several individuals of *Glossophaga* remained.

The tunnel containing the most bats was about four feet wide, 25 feet high, and 600 feet long. It had been dug through a clay-colored, soft, crumbly rock of a claylike texture. Pallas' long-tongued bats were near one end of the tunnel, hiding, singly or in pairs, in small side niches, near the top of the tunnel, formed by the fall of loose concretions and earth. A colony of swallows nested at the other end of the tunnel. Bats of the genus *Carollia* were near the center of the tunnel, where it was darkest, and were hanging free from the roof.

The long-tongued bats could seldom be seen from the floor of the tunnel and were difficult to obtain. When disturbed in the little side-caves, as by a thrown pebble, the long-tongued bats would

dart to another niche. They were rather noisy in flight, making a rustling whir.

At this same locality, on April 3, 1946, Mr. Rabago, manager of the power plant, told me of having seen bats fly out of small caves in the limestone cliff, immediately above the power plant. Although I had looked carefully for bats in these caves, I had found none. On this day, as I walked along the cliff, just above the plant, a bat flew out ahead of me. It took refuge in another cave, and when I searched for it there the bat flew out and returned to the cliff near where I had first seen it. Searching carefully, I found a hole, which I had overlooked before, about five feet from the ground. The hole, under an overhanging ledge, was about eight inches in diameter, coursed straight up for six inches, and then back into the cliff at a 45 degree angle for about seven feet. Turning my light into the opening, I saw two bats clinging to the roof near the back of the hole. Immediately beneath them was a pile of droppings about six inches in diameter and three inches high. One bat dropped when shot but the other flew out and escaped. The one killed lodged behind a pile of droppings, but was scraped out with a long stick.

At Potrero Viejo, seven kilometers west of Potrero, on September 24, 1946, small bats were reported in the old church and Mrs. Leora Forbes got permission, and the key, to enter. We opened the door to find eight of these small bats hanging in a row, each about three inches from the next one, to a rough overhead beam, about 12 feet from the floor. They were in dim light, but plainly visible. They were shy and took flight. Some went behind the altar. I found a small door in the altar and managed to squeeze through the intricately carved mass of 200-year-old wood. In back, between the altar and the end wall of the church, there was a dimly-lighted space about 15 inches wide. Some old wires hung down, and several bats clung to them. Two bracing boards along the back of the altar had other bats hanging head-down with wings wrapped around them, in the manner of *Balantiopteryx io*. Most of them hung by one foot. When my light struck them, they twisted about, peering at it. Most were shy and took flight. Some flew into a small room of the church, and there hung up in the dim light, 15 feet from the floor. One or two took refuge under a table. In all, about 18 to 20 were present. Some flew out, through a small passage, into the church tower, where they hung from the rough stone in a well-lighted place. In the church proper, we knocked down 11 bats with rubber bands. Two were males, each weighing



ten grams. Of the females, three weighed ten grams; three weighed 11 grams; one 13 grams; one 14 grams; one 15 grams; and one 16 grams. The four heavier bats each had a single embryo 20 to 25 millimeters long. The testes of the two males were small. I saw no parasites on the bats.

At Jesús Carranza a colony of about 20 of these bats was found in a dimly-lighted house. The house was notably warm. *Molossus ater nigricans* also was present.

In the theater at Cosamaloapán on the night of April 1, 1947, we noted small bats flying through the beam of the projector. Returning next morning we saw six to eight of these bats hanging from the wires that support the screen and in the space between the elevated stage and the ground found about 700 more. In flight these bats made a dull roar, and a distinct wind. Three hundred more were in the dusky space above the low, partial ceiling of old signboards in the building. They hung head-down, with wings wrapped around the body, with a space of an inch or so separating each bat from its neighbors. Of the 14 saved, six were males and eight were females. One female had an embryo 10 mm. long.

This long-tongued bat seems to be a fruit eater as well as an eater of nectar (a flower bat). Some stomachs examined were full of fruit pulp. On the night of March 19, 1947, 35 kilometers east-northeast of Jesús Carranza, a rat trap baited with banana and set in a chico zapote (chicle) tree caught a *Glossophaga*.

Three kilometers east of San Andrés Tuxtla about 1000 individuals of *Glossophaga* were found in the attic of a partly ruined building of brick and stone, in which we were living. The evening flight of this colony was observed on January 9, 1948. All day the bats were completely silent but for a half hour before sunset there was a great deal of squeaking. The first bat emerged from the attic about 25 feet above the ground just as the sun disappeared behind a dark cloud on the horizon. The bat flew west, then made a complete semicircle about 100 feet in diameter, coming back past the house at the same level at which it left, but some 100 feet to the south. When it came back over the cliff south of the house it was about 75 feet from the tops of the jungle trees. It veered slightly southward and flew off to the lakeside jungle, still at the same level. The second bat emerged about three minutes later; it made a circle about 50 feet in diameter, and pitched down out of sight in a steep dive over the cliff south of the house. Five minutes later three or four bats came out, but all went back in again. Ten minutes later it was rather dark and bats were flying in and out. Ten minutes



later still it was dark and I heard no more squeaking. Turning my light into the eaves revealed four bats that took flight. These were the last, for I looked into the attic and no others remained. The flight lasted about one-half hour in all.

Parasites noted on *Glossophaga* include only winged and wingless flies. Once three to eight small winged-flies to each bat were seen in a colony of seven bats. This was the heaviest infestation noted for this species.

Colonies of *Glossophaga* usually contain animals of both sexes. Breeding seems to continue over much of the year. Pregnant females (each with one embryo) were taken on March 12, 19, 29, April 1, 2 and September 24. On November 5, young were taken with the mothers and a young bat was found on November 18.

### *Anoura geoffroyi lasiopyga* (Peters)

#### Geoffroy's Tailless Bat

*Specimen examined*.—State of Vera Cruz, 1 (U.S.N.M. 144470).

*Additional record*.—Texolo [= Teocelo] (Sanborn, 1933:27).

### *Hylonycteris underwoodi* Thomas

#### Underwood's Long-tongued Bat

*Specimen examined*.—One from 15 km. ENE Tlacotepec, 1500 ft.

*Additional record*.—Metlác (G. M. Allen, 1942:97).

This is a rare species, known from but a few localities. Our single specimen was taken 15 kilometers east-northeast of Tlacotepec on December 12, 1947, when "Four or five of these little bats were found in a cave in the barranca here. The cave is only about four feet in diameter. . . . The entrance is about two by three feet. The bats were behind a ledge, clinging to the highest, darkest place. They were shy, and all but one escaped. Beneath their resting place was a pile of guano about three inches high by six in diameter. There were several pits of jobo plums on the pile, showing that some of this fruit is taken to the cave to be eaten. The cave is in a cliff of conglomerate rock, about 40 feet high. There is a stream of water below the cliff. The cave is about eight feet above the water. No parasites were found on the specimen taken. It is a male with small testes."

### *Leptonycteris nivalis nivalis* (Saussure)

#### Long-nosed Bat

*Specimens examined*.—Twenty-nine from 3 km. W Boca del Río, 25 ft.

*Additional records*.—Pico de Orizaba, type locality (Saussure, 1860:492); "Veracruz" (Ward, 1904:653).

A colony of approximately 200 individuals of *Leptonycteris* was found in a dark, archlike tunnel in the basement of the old hacienda on the arid coastal plain, three kilometers west of Boca del Río on September 28, 1947. When disturbed, the bats retired to a dark room on the floor above. Also present in this room were about 50 individuals of *Artibeus jamaicensis* and a few vampires, *Desmodus rotundus*. The specimens collected were all parasitized, each bat having from three to 10 small winged-flies and several mites. Six of the females taken were pregnant, each having a single large embryo. The testes of the males were small.

### *Carollia perspicillata azteca* Saussure

#### Seba's Short-tailed Bat

*Specimens examined*.—Total 79: 35 km. NW Tuxpan, 2; 25 km. NW Tuxpan, 3; 17 km. NW Tuxpan, 1; 3 mi. NW Nautla, 1; Mirador, 3500 ft., 6; 4 km. W Paso de San Juan, 250 ft., 1; Boca del Río, 10 ft., 1; Río Atoyac, 8 km. NW Potrero, 3; 4 km. WNW Fortín, 3200 ft., 28; Sumidero, 1150 m., 2; Alvarado, 10 ft., 12; Río Blanco, 20 km. W Piedras Negras, 400 ft., 3; 2 km. N Motzorongo, 1500 ft., 1; 3 km. E San Andrés Tuxtla, 1000 ft., 1; 5 km. S. Catemaco, 1; 14 km. SW Coatzacoalcos, 100 ft., 3; Achotal, 1; 35 km. ENE Jesús Carranza, 150 ft., 1; 20 km. E Jesús Carranza, 300 ft., 6; 35 km. SE Jesús Carranza, 400 ft., 1; 38 km. SE Jesús Carranza, 500 ft., 1.

Additional records (Hahn, 1907:112, unless otherwise noted).—Cuesta de Don Lino, near Jalapa (Ward, 1904:653); Jalapa (Ferrari-Pérez, 1886:128, probably this species); Río Tesechoacan, near Pérez, assumed to be the type locality; Jaltipan; Buena Vista.

This bat is one of the most abundant of the fruit bats that occur in Veracruz. Other abundant species are *Glossophaga soricina* and *Artibeus jamaicensis*. *Carollia* is primarily a cave-living species, although, on February 1, 1947, 14 kilometers southwest of Coatzacoalcos, and on December 15, 1947, 4 km. W Paso de San Juan, individuals were found in pipes beneath railroad embankments and a paved highway. On March 19, 1947, 20 kilometers east of Jesús Carranza, a colony was found in a hollow tree. In 1948, 38 kilometers southeast of Jesús Carranza, several small colonies were found in hollow trees in relatively open jungle.

Four kilometers west-northwest of Fortín, on March 27, 1946, Mr. Daniel Rabago, the engineer in charge of the power plant of the Moctezuma Brewery, guided me (Dalquest) to some artificial tunnels connecting the Río Metlac with the river to the west. The valley to the west is 120 meters higher and water is piped from a dam through an artificial tunnel and down to the power house. The main tunnel is 200 meters long, about seven feet high and seven wide, and is constructed through soft, shale-like rock. Midway, there is a side-tunnel, about 50 meters in length, similar to the main tunnel but containing no pipes or artificial lights. It opens on the

side of the hill and the opening is barred with grill work. In this side-tunnel we found two bats. The one captured was a female of *Carollia*. About 200 meters farther downstream another tunnel penetrates the hillside. This is a slotlike tunnel about four feet wide and 25 feet high. At the west end of this tunnel, many swallows were nesting. From the center to the eastern end we found many individuals of *Carollia*. They were clinging either singly or in small groups. Perhaps 50 were present in the tunnel. It was so high that it was necessary to shoot the bats. I killed 10 of *Carollia* and one *Glossophaga* that were in a condition good enough to save. All of the specimens taken were females.

At the same locality, on April 1, 1946, one cave was reached only after considerable work with the machete. Only vampires were present. Entrance to the other cave was gained by sliding on our backs, down a 20 foot-long tunnel inclined at a 30 degree angle. The tunnel was about two feet high by six feet wide. The cave, about 50 feet wide and 70 to 80 feet long, is 12 to 20 feet in height. Falls of loose rocks and large boulders partition the space in the cave, and the floor is littered with angular pieces of limestone from a few inches to several feet in diameter, and is slippery because of bat guano, with many deep pits among the rocks. Great care is required in moving about in the cave. Probably about 100 individuals of *Carollia* were present of which I caught ten. All were males. The bats tended to hang together, though not in clusters, from low places in the ceiling. In pursuing them about the cave I discovered that their favorite perches were places where the roof was five to six feet high, usually near the side of the main room or under projecting ridges of large boulders. An interesting companionship between a *Carollia* and a *Natalus stramineus* was noted here, and is described in the account of *Natalus stramineus*.

Stomachs of *Carollia* taken at the Río Atoyac, eight kilometers northwest of Potrero, held a semi-liquid mass of yellow pulp, probably of the wild sweet-lemon or wild orange, both of which were ripe and common in the vicinity. One bat was taken in a banana-baited mouse trap set beside the trail in dense jungle at the above mentioned locality on February 25, 1946. Another was taken here in a trap set on the ground on March 25, 1946. Another was taken in a trap set on the ground on March 6, 1946, at the same locality, and under rather unusual circumstances. A line of traps baited with bananas had been set along the river for *Oryzomys*. One trap was set under an overhanging bush. The foliage of the bush formed a dense arch with a doughnut-shaped cavity a foot in diameter extending

in a circle around the bush. The distance across the circle, from one side to the other, was about three feet. I broke an opening, about seven inches across, through the foliage and set a trap in the cavity. The following morning the trap held a *Carollia*. The bat must have smelled the banana, and entered through the small opening, landed on the ground beside the trap, and been caught while feeding on the bait. Seemingly this species has an excellent sense of smell.

On March 11, 1946, at the same place I noticed that in a bunch of sweet rotan bananas that we had hung in the shade of an orange tree a few meters from camp, a section about 20 millimeters in diameter had been eaten from the skin of a ripe banana and through this opening a section of banana 50 millimeters in length and 25 millimeters in diameter had been eaten out. The upper and lower ends of the cavity were smoothly concave, indicating that the center core of the banana had been eaten more extensively than the surrounding pulp, perhaps because it was more tasty or because it was more easily available to the bat. This banana was left on the stalk, and a mouse trap baited with banana was tied just above it. The next morning the trap and the banana previously eaten were undisturbed, but part of another ripe banana in the clump had been eaten. All bananas except this one were removed from the stalk, and the banana-baited trap was tied to it. Next morning a male *Carollia* was in the trap.

The following observations were made at a place two kilometers north of Motzorongo and entered in my field notebook on December 10, 1946. "For three nights now I have been watching fruit bats over a pool of water in the arroyo here. Three or more species are present, as well as *Saccopteryx bilineata* and *Myotis volans* [proved to be *Eptesicus propinquus*] and probably other bats. One small fruit bat is especially common, but only last night was I able to get one, and found it to be this species (*Carollia perspicillata*). . . . [Bats of this species] will hit a wire strung over the surface of the pool, and even fall into the water, but they are able to take off again. I caught one by setting banana-baited mouse traps tied to branches in their favorite resting tree. The specimen is a male with testes four by two millimeters. Two small winged-flies were the only parasites noted."

Bats of this species arrived at the pool shortly after it was completely dark, and some were present two hours later. They come in at a height of three to five feet making a swish like a bullet.

Possibly this is the end of a dive down to the pool from a higher level. They begin to flap their wings when within 10 feet of a bush or low-hanging branch of a tree on which they intend to land. The swish of their arrival, followed by a flapping, is easily heard and the air that is moved makes leaves and ferns rustle. It is my impression though that they never, or at least rarely, strike things with their wings. In this they are unlike some fruit bats. Arriving under a bush, they seem to drift up into it. This upward movement and alighting is in complete silence, in contrast with their noisy arrival. They usually rise two or three feet, until well into the network of vines and branches, before alighting.

When frightened, they leave their perch almost as silently as they arrive, but the wind from their wing beats causes the leaves to rustle. Once outside the bush, there is a great flapping; often they circle or spiral upwards, before flying off to a perch in another bush but sometimes leave with a swift, rushing sound.

*Carollia* is rarely parasitized. The only parasite noted was a species of small, winged fly. Four kilometers west-northwest of Fortín, on March 29, 1946, a bat that seemingly died from wounds received from another bat was clinging to the wall of a cave about six feet from the ground. It had not been dead for more than a few hours when found, for it was not at all decayed. The nose-leaf and skin of the muzzle had been torn off.

Males and females often are in separate colonies. Most of the females found between March 6 and March 29 were pregnant. Four taken on December 11 had swollen uteri but no recognizable embryos.

### *Carollia castanea subrufa* (Hahn)

#### Allen's Short-tailed Bat

Records (Hahn, 1907:115).—Mirador; Otatitlán; Coatzacoalcos; Minatitlán; Achotal.

Hahn (1907) lists both *Carollia perspicillata azteca* and *Carollia subrufa* from localities in Veracruz. When our large series of *Carollia* from Veracruz is compared with his descriptions of *C. perspicillata azteca* and *C. subrufa*, and with a specimen from Veracruz identified by him as *C. subrufa*, we are unable to recognize two species. No specimen seen from Veracruz is so large as the largest *C. p. azteca* nor smaller than the smallest *C. subrufa* listed by Hahn from the general latitude of the localities of occurrence in Veracruz. Most of our specimens resemble the larger individuals of *C. subrufa* and the smaller individuals of *C. p. azteca* in size, both as to external measurements and cranial measurements. Light, heavy and intermediate dentition is found in our material. Consequently all of our material from Veracruz is referred to the earlier named *C. perspicillata azteca*.



***Sturnira lilium parvidens* Goldman**

## Yellow-shouldered Bat

*Specimens examined*.—Total 16: Hacienda Tamiahua, Cabo Rojo, 4; 12½ mi. N Tihuatlán, 300 ft., 11; 5 mi. S Catemaco, 1.

Additional record.—Mirador (Hershkovitz, 1949:442).

The sixteen specimens from Veracruz and the one specimen available from Tabasco (5 mi. SW Teapa) are dark as are seven of the 13 specimens available from Guatemala. The two specimens from the state of Puebla and many of the specimens from western México (Jalisco, Nayarit, and Chihuahua) are notably paler. But there is variation in each lot. Also there are two or more color phases. No consistent geographic variation in the skulls can be correlated with the dark color of the specimens from eastern Mexico. Therefore the specimens from the state of Veracruz are here referred to the subspecies *S. l. parvidens*.

***Sturnira ludovici* Anthony**

## Anthony's Bat

Record.—Mirador (Hershkovitz, 1949:442).

***Chiroderma villosum jesupi* J. A. Allen**

## Isthmian Bat

Records.—Presidio (G. M. Allen, 1927:158); Achotal (Sanborn, 1936:103).

Handley (1960:466) regards the name *Chiroderma isthmicum* Miller, 1912, previously used for this kind of bat, as a synonym of *Chiroderma jesupi* J. A. Allen, 1900, which is only subspecifically distinct from *Chiroderma villosum* Peters 1860.

***Artibeus jamaicensis jamaicensis* Leach**

## Jamaican Fruit-eating Bat

*Specimens examined*.—Total 154: 5 mi. S Tampico, 3; Hacienda Tamiahua, Cabo Rojo, 1; Tlacolula, 60 km. WNW Tuxpan, 6; Potrero Llano [= Potrero del Llano], 350 ft., 4; 12½ mi. N Tihuatlan, 300 ft., 2; 3 mi. NW Nautla, 1; Teocelo, 4000 ft., 1; 3 km. W Boca del Río, 10 ft., 34; Boca del Río, 10 ft. 30; 5 km. SW Boca del Río, 3; 8 km. NW Potrero, 1700 ft., 16; 5 km. N Potrero, 1500 ft., 17; 7 km. NW Potrero, 1500 ft., 3; Potrero Viejo, 5 km. W Potrero, 2; Cueva de la Pesca, Potrero, 650 m., 8; Cautlaupan [= Cuautlapan], 4000 ft., 1; Sala de Agua, 1500 ft., El Maguey, 8 km. S Potrero, 13; Río Blanco, 20 km. W Piedras Negras, 400 ft., 2; 5 mi. S Catemaco, 1; 38 km. SE Jesús Carranza, 500 ft., 6.

Additional records (Andersen, 1908:267).—Plan del Río; Mirador; Tuxtla [probably Santiago Tuxtla].

This is one of the most common fruit bats of Veracruz, and is probably the one most often seen. It is principally a cave-living species, but on the coastal plain, where caves are scarce, it lives in crevices in trees and even in wells.

This species was found in a limestone cave in a beautiful tropical setting at El Maguey, Sala de Agua, eight kilometers south of Potrero, on February 10, 1946. Approximately 200 feet in from the

mouth, further progress is prevented by a swift river that, I was told, emerges from the mountain five kilometers away. The cave varies from 10 to 30 meters in width and six to 10 meters in height. The floor is damp earth with many boulders, but walking is not difficult. Bats were found only far back in the cave, on the very banks of the river. There many were heard and seen in flight. They were quite shy, and only once was a cluster seen. It was made up of perhaps a dozen individuals in a rough pit, two feet in diameter and one foot deep, in the roof of the cave. They flew before I could get a shot. Most of the other pits in the roof contained one, two or three bats each. They hung head downward, some against vertical rocks and others free. Sixteen were taken by shooting. Several of those killed continued to cling to the rock and had to be dislodged by throwing stones; others could not be reached at all.

For such heavy, stocky bats they fly very well. They make an audible swish as they fly, but they maneuver well and perch skillfully. No guano was noted on the floor, but numerous cores of the jobo plum were strewn about, obviously by the bats. The core is about the size and shape of a peanut without the constriction, and is not unlike a peanut shell in texture. The fresh fruit has a pulp layer one-quarter inch thick over the core.

About 75 bats were seen. Others may have been perched in the cave, back, over the river, or at least where I could not see them. Although they flew out over the river, none was actually seen perched there.

Five kilometers north of Potrero, in a beautiful tropical forest, on February 11, 1946, another large colony was found in a small cave on a limestone hillside. The mouth of the cave is an arch about 30 feet wide and 20 feet high. The floor is a jumble of fallen boulders, and the rejected cores of the jobo fruit almost cover some of the rocks. Several short, crevice-like tunnels lead from the entrance room, but no bats were found until I went through a small opening into a hemispherical room about 50 feet across. Bats by the thousands were present. Clusters of hundreds clung to the highest parts of the ceiling, and others clung to the walls, within reach of my hand. The wings of thousands in flight made a loud, flapping whir. In the center of the floor was a tarlike pool—the excrement of vampire bats. I estimated that 100 vampires and 2000 Jamaican fruit-eating bats were present. The two kinds remained separate, the vampires in the center of the ceiling and the fruit-eating bats elsewhere. The two kinds looked much alike but

behaved differently. The vampires clung with thumbs as well as the feet, and moved about on the rock. The fruit-eating bats clung with the feet alone and did not shift their positions except to fly. The vampires crept into crevices to escape but the fruit-eating bats simply flew about; a few of the latter went into the entrance room, but most of them flew from perch to perch. All of the fruit-eating bats were adult, whereas the vampires were of several ages. The odor in the cave was that of ammonia from the vampire's pool. No droppings of fruit-eating bats were noted, although the cores of the jobo fruit were common on the floor. The cores were less common than in the entrance room, however.

These big bats are noisy feeders. On many occasions I watched bats that probably were this species, but that could not certainly be identified. The following notes, however, are accompanied by specimens, and the identity of the animals is known. On the Río Blanco, 20 kilometers west of Piedras Negras on October 6, 1946, where actual specimens were taken and saved, the bats fed on the jobo plums by flying into the clusters of fruit at the ends of the branches, with a great fluttering of wings and rustling of branches and leaves. Bats picked the fruits and flew away with them. The bats often alighted in the plum tree to eat the fruit; the pits dropped into the water below. Mostly, however, the bats flew to another tree or bush to eat. One of their favorite perches was in a bush not more than six feet high. There was a dense mass of vines and dead branches under the tree that formed a network, which, on first inspection, seemed to be too dense for such a large bat to penetrate. Yet they fluttered in, and clung to a branch, twig or vine. When a light was turned on they were seen hanging head down, each peering at me over the top of a fruit that was held in the mouth and by means of both wrists. When close to the bats I could see a dull red glow from their eyes. They were shy and usually flew as soon as the light struck them. Rarely would they wait until I started to put my gun to my shoulder. Only one was shot. Evidence showed that they alighted on the ground to feed on fallen fruit, although I was never able actually to see the bats on the ground. Their fluttering was noisy. One time, after watching them for about an hour a tropical downpour set in. Then the bats ceased to flutter, but were about as active [otherwise] as ever. They flew to the plum tree and returned, but were as silent as owls.

On October 10, 1946, five kilometers southwest of Boca del Río, a small colony was located among the roots of a tall strangler-fig. The roots were rather flat, and extended 25 feet up in the air. There

were numerous bits of figs and some pits of jobo plums beneath the crevices. The bark at the tops of the crevices was scratched and showed the reddish inner layer. This was mainly a night resting place of fruit-eating bats, but about five were hidden in crevices. The one taken for a specimen was an adult with large testes.

On another night I put a chair under the most used crevices in the tree and noted that the bats eyes glowed red in the beam of a flashlight. Two males with testes of moderate size and a non-pregnant female were shot. Each dropped wild figs that were green in color and rather tough but seemingly ripe.

At Potrero Viejo, 1500 feet elevation, on the evening of February 14, 1946, Mrs. Leora Forbes heard that bats were occasionally seen in one of the rooms of the hospital of the Potrero Sugar Company. We visited the hospital about 10:00 p. m. and the intern told us that approximately 10 bats had been killed in one room a few nights earlier. The bats were killed because they annoyed the patients, who mistook the bats for vampires, and because the bats hung from crevices in walls near the ceiling to eat fruit. They left considerable debris. Only two bats were present when we examined the room—both of this species. They were collected and prepared. The walls were well marked with the pulp of a red fruit. The pulp contained a number of seeds. From the appearance of the wall, one could wrongly imagine that overripe raspberries had been thrown against it and left to dry. The bats visited a single dimly-lighted room and the corridor leading to it.

Embryos were found in this species on February 10 and 11. Young bats were seen in caves in March and late April. Small winged-flies are the common parasite on this species.

### *Artibeus lituratus palmarum* J. A. Allen and Chapman

#### Big Fruit-eating Bat

*Specimens examined*.—Total 9: Tlacolula, 60 km. WNW Tuxpan, 2; 4 km. NE Tuxpan, 1; 12½ mi. N Tihuatlán, 300 ft., 3; Mirador, 3500 ft., 1; 4 km. WNW Fortín, 3200 ft., 1; 20 km. E Jesús Carranza, 300 ft., 1.

*Additional record*.—Paso de Ovejas (Villa, R., and Jiménez, G., 1962:394).

This species was rare in the state of Veracruz, and our observations on it are scanty. Its habits seem to differ somewhat from those of *Artibeus jamaicensis*.

In early April, 1946, four kilometers west-northwest of Fortín, large bats were noted on several occasions along a limestone cliff. In spite of numerous attempts to stalk them, the bats were so shy that they flew before I could get within gunshot range. On April 5, however, one bat hesitated too long, and I shot it. It was hanging



in the open, shaded but in full daylight, from a rough place on the ledge above a pile of "droppings." These, like the reddish-brown, flattened, ovoid "droppings" so often found beneath the roosts of *Artibeus* are actually balls of the skins or rinds of fruit. The bats chew the fruit while holding it between their wrists. Both pulp and rind are taken into the mouth. The pulp is swallowed and the rind is rejected in the form of a small pellet. In a few hours these pellets take on the characteristic reddish-brown color.

At Hacienda Mirador the skull of the big fruit-eating bat was obtained from a mummified animal that had been saved by Mr. Walter Grohman.

Twenty kilometers east of Jesús Carranza, while my companions and I were going along a jungle trail about midnight with a hunting light, a pair of tiny, bright-red eyes was seen in a small mango tree, about 15 feet from the ground. A shot brought down a specimen of *A. l. palmarum*.

A male taken on April 5, had enlarged testes, that measured six by eight millimeters. A female taken on February 7, was not pregnant.

### *Artibeus cinereus phaeotis* (Miller)

#### Gervais' Fruit-eating Bat

Records (Davis, 1958:165, unless otherwise noted).—Minitatlán; Jesús Carranza; Río Solosuchil; Achotal (Sanborn, 1947:223—as *Dermanura fucundum*).

### *Artibeus toltecus* (Saussure)

#### Toltec Fruit-eating Bat

*Specimens examined*.—Plan del Río, 1000 ft., 2 (catalogue Nos. 2914 and 2915 Texas Agric. and Mech. College; see Davis, 1944:378).

Additional record.—Mirador (Hershkovitz, 1949:449).

*Artibeus toltecus* is here accorded specific rank, instead of subspecific rank under *A. cinereus*, in accordance with the findings of Davis (1958:166).

### *Artibeus turpis turpis* Andersen

#### Dwarf Fruit-eating Bat

*Specimen examined*.—Arroyo Azul, 1.

Additional records.—Plan del Río (Davis, 1958:163); Buena Vista (Andersen, 1908:310).

The trinomen instead of the binomen (*auct.*) is here used because Davis (1958:166) concluded that *Artibeus nanus* Andersen is a subspecies of *Artibeus turpis* Andersen that has one page of priority. Davis (1958:163) regards *A. t. nanus* as occurring only in western México and regards *A. t. turpis* as occupying eastern and southern México. Therefore, Andersen's (1908:310) record of a specimen from Buena Vista, Veracruz, may relate to *A. t. turpis* although recorded by Andersen (*loc. cit.*) under the name *Artibeus nanus*.



*Centurio senex* Gray

## Wrinkle-faced Bat

Records.—Las Vigas (Ward, 1904:653); Mirador (Sanborn, 1949:198); Dos Caminos, km. 354, 4500 ft. (Sanborn, 1949:199); Orizaba (Sumichrast, 1882:203); Minatitlán (*ibid.*).

## Family Desmodontidae

*Desmodus rotundus murinus* Wagner

## Vampire Bat

*Specimens examined.*—Total 70: Tlacolula, 60 km. WNW Tuxpan, 1; 7 km. SW Tuxpan, 1; 10 km. SW Jacales, 6500 ft., 1; 1 km. E Jalacingo, 6500 ft., 3; 3 km. W Boca del Río, 10 ft., 9; 5 km. S Jalapa, 3 (Chicago N. H. Mus.); Boca del Río, 10 ft., 3; Ojo de Agua, 8 km. NW Paraje Nuevo, 9; 8 km. NW Potrero, 1700 ft., 1; 13 km. WNW Potrero, 2000 ft., 4; 5 km. N Potrero, 1500 ft., 12; 4 km. WNW Fortín, 3200 ft., 1; Grutas Atoyac, 2 km. E Atoyac, 1; Cueva de la Pesca, Potrero, 650 m., 1; 7 km. SE San Juan de la Punta, 400 ft., 2; 3 km. W Acultzingo, 7000 ft., 8; 3 km. E San Andrés Tuxtla, 1000 ft., 4; Achotal, 3 (Chicago N. H. Mus.); 20 km. E Jesús Carranza, 300 ft., 3.

Additional records.—5 km. N Jalapa (Davis, 1944:378); Potrero Viejo [= Potrero Viejo] (Hooper, 1947:43).

The vampire bat (*vampiro* in Spanish) in Veracruz is typically a cave-dweller but lives also in crevices in rocks, hollow trees, old wells and abandoned buildings. Probably these nontypical places are chosen when suitable caves are lacking. On the arid coastal plain, where caves are scarce, several colonies were found in old wells.

Five kilometers north of Potrero on February 11, 1946, approximately 100 vampires were found in a cave along with about 200 individuals of *Artibeus jamaicensis*. The vampires were in a cluster in almost the center of the ceiling. There was a pool of black, tar-like, digested blood on the floor beneath them. A strong odor of ammonia came from this pool. The vampires clung to the roof with both feet and the thumbs, and braced their bodies and raised their heads, peering at the intruder.

I fired twice into the cluster, and to my great disgust, the bats that fell plopped into the stinking pool, and were almost covered by the muck. The others flew and were lost to sight in the mass of wildly flying Jamaican fruit-eating bats (*Artibeus jamaicensis*). I then noted the vampire bats entering a narrow cleft into which they crept, far back out of my sight.

All of the fruit-eating bats were adult, but the vampires were of several sizes; some were almost full-grown and others must have been only a few days old. Some adult females were pregnant.

At the cave, "Ojo de Agua," eight kilometers northwest of Paraje Nuevo, on February 12, 1946, in one of the upper levels of the cave, where it is relatively dry, a companion and I found approximately 50 vampire bats hanging in a pit, a meter wide and a half a meter deep, in the limestone roof of the cave. On the floor four meters beneath, was a circular pool of excrement and blood. I fired three shots into the cavity and then quickly leaned forward over the pool. Falling bats bounced off my head and shoulders and only a few fell into the pool. The remainder of the bats flew farther into the cave and took refuge, singly or in small numbers, in pits and crevices, from which they flew with a loud swishing of wings at my approach. They were extremely agile and able to creep rapidly in crevices. One individual lay on a flat rock with its body on a horizontal plane. From this position it jumped, did not fly, horizontally to another rock eight inches away. It made this jump quite gracefully and landed with wings closed. It scuttled over the rock and into a crevice. We explored the cave rather thoroughly but found no other species of bats. The lower levels of the cave are cold and damp. About 75 meters from its mouth there is a rushing underground river and the air is full of spray. No bats were found in this part of the cave.

On the Río Blanco, 20 kilometers west of Piedras Negras, on September 30, 1946, we were told of a house with an old well, where bats were abundant. On peering into the well, which was perhaps 30 meters deep, about six vampires were seen clinging to the wall, and others flitted about beneath them. Attempt was made to catch some in a net, but they took refuge in small holes cut for footsteps. Then an old five-gallon can was filled with corncobs and red-hot coals; a handful of chili peppers was added. This was lowered on a long rope, and the well was filled with smoke. The bats could be heard fluttering about, but although my companion and I waited for more than an hour, none was driven out by the smoke.

It is well known that vampires feed on blood but it is not so well known that the animals preyed upon by the bats vary from place to place. In the state of San Luis Potosí, for example, vampires commonly attack chickens. In Veracruz, they seem never to do so, and people were unwilling to believe that they did so elsewhere. In Veracruz, the following notes were made at the Río Atoyac, eight kilometers northwest of Potrero, on March 21, 1946. "We have been in this area about six weeks now. I have examined many oxen, horses and burros for evidence of vampire attacks. No oxen bitten

by vampires were seen by us, and relatively few horses with scars of vampire bats were noted. Almost all the burros seen had scars or wounds inflicted by these bats." Most of the bites were on the sides of the neck or shoulders. Some freshly bitten animals were noted. Numbers of flies buzzed about the wounds. Hornets were chewing on one fresh wound but the burro seemed to be unconscious of their bites or the presence of the flies. Masters of the burros seemed to be equally indifferent and I saw no evidence that they ever treated any of the bites. Seemingly the animals suffer no permanent ill-effects from a moderate number of vampire bites. Certainly, though, the wound is open to the attacks of parasitic insects and infection.

Resident people know of this bat from its attacks on animals, but most persons do not recognize the bat as a vampire when they see it. The common, large, Jamaican fruit-eating bat, *Artibeus*, was often confused with the vampire.

The vampire seems to have no regular breeding season. A few young bats, in various stages of development, as well as pregnant females and non-pregnant, non-lactating, females, were found in each large colony of vampires examined. The common parasite on the vampire bat is a small, winged fly, which, upon superficial inspection, seems to be the same as the fly found on *Artibeus jamaicensis*.

### *Diphylla ecaudata* Spix

#### Hairy-legged Vampire Bat

*Specimens examined*.—Total 8: Ojo de Agua, 8 km. NW Paraje Nuevo, 1; 7 km. NW Potrero, 1700 ft., 3; 7 km. NW Potrero, 1500 ft., 2; 13 km. WNW Potrero, 1700 ft., 1; 5 km. S Potrero, 1700 ft., 1.

Additional record.—Orizaba (Málaga and Villa, 1957:530).

The name *Diphylla ecaudata centralis* Thomas, previously used for this bat, has been shown by Burt and Stirton (1961:37) to have been based on material that is inseparable from that on which the name *Diphylla ecaudata* Spix was based. *D. e. centralis*, therefore, is a synonym of *D. ecaudata*. The latter stands now as a monotypic species.

The hairy-legged vampire is a cave-living species. In Veracruz we found it associated with the vampire, *Desmodus*. The principal differences noted in the habits of the two kinds are that *Diphylla* is relatively solitary, prefers darker retreats, and leaves no pool of digested blood beneath its roosts; instead of a pool, we found only dry, brown stains beneath the perches of *Diphylla*.

## Family Natalidae

*Natalus stramineus saturatus* Dalquest and Hall

## Mexican Funnel-eared Bat

*Specimens examined*.—Total 110: 14 km. NW Tuxpan, 10; 9 km. NW Tuxpan, 7; 13 km. WNW Potrero, 2000 ft., 10; 4 km. WNW Fortín, 3200 ft., 1; 3 km. E San Andrés Tuxtla, 1000 ft., 82.

Additional records.—Jalapa (Ward, 1904:638); Mirador (Miller, 1902:400); Tilapa (Sumichrast, 1882:202); San Andrés Tuxtla (Miller, 1902:400).

The specific name *stramineus* instead of *mexicanus* is used here in conformance with the findings of Goodwin (1959).

The specimens from the northern part of Veracruz (14 km. NW Tuxpan, and 9 km. NW Tuxpan) differ notably in coloration from the specimens in the south. In coloration, specimens from the northern part of Veracruz (also specimens from Tamaulipas: 6 km. SW Rancho Santa Rosa; 16 mi. W, 3 mi. S Piedra; 14 mi. W, 3 mi. S Piedra; 20 mi. N, 3 km. W El Mantie; 8 km. NE Antigua Morelos) are closer to *N. s. mexicanus* than to *N. s. saturatus* but resemble the latter in longer skull and longer maxillary tooth-row. Consequently all of the specimens from Veracruz are referred to *N. s. saturatus*.

This species was abundant in a lava cave three kilometers west of San Andrés Tuxtla (see account of *Pteronotus psilotis* for description of cave). About 200 feet from the entrance of this cave, a geologic fault separated the cave into upper and lower parts. A rock face or wall now interrupts the otherwise relatively level cave, and above this wall the cave continues for an undetermined distance. In the upper part of the cave we found thousands of individuals of *Pteronotus psilotis* and *Pteronotus davyi*. In the lower cave we found *Pteronotus parnellii*, *Glossophaga soricina*, *Carollia perspicillata*, *Desmodus rotundus* and *Natalus stramineus*. The numbers of individuals of *Natalus* in the cave varied greatly from day to day, reaching a low point of two bats on January 2, 1948, and a high of about 300 on January 10. On all days except January 10, all the funnel-eared bats (*Natalus*) in the cave were found in a single area, from five to 25 feet in front of the barrier wall. Here the cave was cool and damp. This was the part of the lower cave, farthest from the mouth, where it was cool; above the rock wall in the upper cave the air was hot. The bats were from four to 15 feet from the floor. Some hung free from the ceiling and some were in cracks and crevices, but most of the bats clung to the vertical walls of the cave.

On January 10, when there were about 10 times as many funnel-eared bats in the cave as were ever noted before, approximately 50 of them were hanging from the roof in a wide part of the cave, only about 100 feet from the entrance. The bats had chosen a part



of the room from which the lighted entrance of the cave was hidden by a bend.

The funnel-eared bats were not at all shy; individuals were usually plucked from the wall as they twisted about, watching the light, although on most occasions, a few took flight when an observer approached. It was noticed that the more bats there were in the cave, the more shy they were. When bats too high to be reached by hand were shot, the other bats hanging nearby rarely took flight at the sound of the gunshot.

All of the females taken in early January were non-pregnant and they were not lactating. The testes of the males were small. This species was commonly parasitized by a small winged-fly; three to seven flies were present on almost every bat taken.

On April 1, 1946, a *Natalus* was captured four kilometers west-northwest of Fortín in a cave occupied by a colony of *Carollia perspicillata* (see account of *Carollia* for description of the cave). The *Natalus* was in a most unusual association with one *Carollia*. "One *Carollia* hung from the center of the roof, usually in the center of a large open place. I climbed up on a boulder and shined my light directly on this bat. When I did so I noticed a tiny yellow bat clinging to the roof beside the *Carollia*. Unfortunately the two bats were too high to reach with my net, and I was too close to them to shoot. Time after time I would get within a few feet of them before they would fly. Always the two clung together and flew together. They did not associate with the other *Carollia* in the cave—by this I mean that they stayed near the ceiling in the open part of the cave. The presence of the little yellow bat enabled me to . . . [locate] the *Carollia*, and I could always find the little yellow bat by looking for a *Carollia* hanging from the open ceiling. Being unable to catch these bats with my net, I was forced to shoot them. The one shot brought down both. The little yellow bat is a *Natalus mexicanus* [= *N. stramineus*], a female. I examined the *Carollia* very carefully and found it to be a male, as were all the other *Carollia* in the cave, and to differ in no appreciable way from all the other *Carollia* present. The relationship between these two species is difficult to explain, but I had them under observation long enough to be sure that it existed."

No *Natalus* was observed feeding or hunting. The species is insectivorous, for one specimen taken in a cave at night, where it, like many other species of bats, had retired to rest after the evening hunt, had its stomach crammed with insect remains.



The maie of *Natalus* possesses a glandular structure on the head not noted in any other kind of bat. It lies between the skin and the skull. It is attached to the skin between the eyes, and extends backwards from the point of attachment, becoming broader and thicker, and forming a cap over the top of the skull (see Dalquest, 1950:438-440). Nowhere is it attached to the skull. This glandular structure is absent in the female.

Family Vespertilionidae

*Myotis velifer velifer* (J. A. Allen)

Cave *Myotis*

*Specimens examined*.—Total 155: 4 km. E Las Vigas, 8500 ft., 143; 5 km. N Jalapa, 4500 ft., 1; 4 km. WNW Fortín, 3200 ft., 3; 3 km. SE Orizaba, 550 ft., 8.

Additional records.—Las Vegas [probably = Las Vigas] (Ward, 1904:647); 5 km. N Jalapa, 4500 ft. (Davis, 1944:378); Xuchil (Miller and Allen, 1928:91); Orizaba (Miller and Allen, 1928:91).

This is a species of the upland, and it is common on the Mexican Plateau. It enters the upper humid division of the Tropical Life-zone in central Veracruz, and was taken as low as 3200 feet elevation.

In the daytime *Myotis velifer* retires, singly or in large colonies, to secluded retreats in buildings, crevices in cliffs, and caves.

Three kilometers southeast of Orizaba, on December 20, 1946, a colony of about 50 of these bats was living in crevices in the roof of a powerhouse where the machinery roared so loudly that persons had to shout to make one another hear. A few individuals of *Molossus ater* also lived there. We were told that the bats lived there the year around, emerging from the crevices in the evening. When they returned, they did not enter the crevices immediately, but hung from the ceiling in groups for an hour or so. The ceiling is about five meters high. By using a ladder, we caught five of the bats.

On March 28, 1946, along the face of a limestone cliff here, four kilometers west-northwest of Fortín, several hanging-up places of fruit bats were discovered but no bats were present. Near one of the resting places of fruit bats the droppings of an insectivorous species were noted. The cliff here is composed almost entirely of fossil trees of some palmlike species that had annual growth rings several inches thick. Many of these trees were hollow in life, the central cavity being two to four inches in diameter, circular in shape, and several feet in length. One of these cavities extended almost vertically from an overhanging wall. It was from this cavity that the droppings seemed to originate. With the aid of a ladder I got

directly under the opening, and reflected a beam of light into it revealing two small bats about six feet from the opening and 12 feet from the ground. By means of a wire hook at the end of a bamboo pole one of the bats was obtained and proved to be *Myotis velifer velifer*.

This species is insectivorous. Like many bats, it retires to rest for an hour or so after hunting. About one hour after dark, near a waterfall, five kilometers north of Jalapa, at 4500 feet elevation, one of these bats was taken from a cavelike opening where no bats were found in the daytime. Two red-collared swifts were also caught here.

*Myotis velifer* emerges from its retreats, and begins its evening feeding rather late. The following notes were made on April 6, 1946, four kilometers west-northwest of Fortín. "Tonight I went hunting bats over a pool in the river. . . . In the past I have seen many *Myotis* here. They appear too late in the evening to shoot so we have twice strung wire over the pool. On each occasion, six to ten *Myotis* have struck the wire, often giving it a hard blow. . . . [but] none has been captured or, so far as I know, knocked into the water. In desperation tonight I focused the beam of my flashlight across the pool, and aiming down this lighted part, I pulled the trigger whenever a bat crossed the beam. After wasting several cartridges I finally . . . killed another of these large *Myotis*, this time a male."

In the tropics this species probably does not hibernate. We were told that the colony near Orizaba is active the entire year. In the uplands, *Myotis velifer* hibernates in large colonies. Approximately four kilometers east of Las Vigas many colonies of this species lived in the lava caves on the small volcanic peak called Volcancillo, and in the lava flows below the peak. These caves were first visited on January 11, 1949. The temperature of the outside air was low but, save in early morning, above freezing. The caves were entered through holes. These are similar to those formed by the collapse of parts of the roofs of lava tubes. Inside these caves, the ceiling, walls, and floor are cool and wet. The floors are usually strewn with angular blocks of lava that have fallen from the ceiling, which make walking hazardous. The basaltic lava is fractured and soft; in places it is more scoria than basalt. The caves vary from simple tubes too small to permit a person to stand upright, to great halls where the beam of a flashlight scarcely reaches to the ceiling. *Myotis* was rarely less than 10 feet above

the floor of the caves. Most individuals hung from damp places; many of the bats were "frosted" with droplets of water. Many hung singly; some were in pairs and small groups; most were in groups of 60 to 200. Nearly all of the bats were completely torpid; only a few were active in the cave and flying about. Some groups of bats were noted, day after day, in the same place in the same cave. Some of the bats, at least, remained in one position for more than a week. The torpid bats were dislodged with a pole, and fell to the floor. They were able to squeak, and to writhe about slowly; and after about 10 minutes in the collecting bag they became warm and completely active. *Plecotus mexicanus* and *Pipistrellus subflavus veraecrucis* were also present in these caves.

The breeding season of *Myotis vclifer* in Veracruz may be irregular; pregnant females were taken on March 28, December 20, and December 21. The only parasites recorded were from bats taken in the tropical area of Veracruz. These were a flea, a winged fly, and what appeared to be a large louse.

### *Myotis fortidens* Miller and G. M. Allen

#### Cinnamon *Myotis*

*Specimens examined*.—Total 7: Río Blanco, 20 km. WNW Piedras Negras, 3; 20 km. ENE Jesús Carranza, 200 ft., 4.

At our camp on the Río Blanco, 20 kilometers west-northwest of Piedras Negras, 200 feet elevation, we were told that small bats occasionally visited a nearby house in great numbers. We requested the persons who lived in the house to try and capture some of the bats. On the morning of May 13, 1946, two bats were brought to us and we were told that on the previous night the bats had been swarming at the house, alighting on the thatch of one end wall. The two bats brought into camp had been knocked down with a bamboo switch.

I visited the house and found it to be of the ordinary kind, with roof and end walls constructed of thatch of the fronds of the coyol palm. On the ground at the outside base of one end wall there was a considerable quantity of bat droppings, all fresh. We lifted the thatch, a layer at a time, but found no bats. Seemingly the thatch was used as a resting place only at night. The early part of the next night was spent at this house, but no bats were seen and we were told that the bats might not return for several nights. Although the inhabitants were asked to call us immediately when the bats did return, they failed to do so. However, when the bats next returned, on May 29, one of them was knocked down for us with a bamboo switch.

Twenty kilometers east-northeast of Jesús Carranza, on April 13, 1949, several small bats were noted flying about the palm-thatched roof of a house in the early evening. Two of these were shot; both proved to be of this species. On the evening of May 16, 1949, bats were noted about the thatch roof of the same house. They were not disturbed, but the following morning the thatch was lifted and seven bats emerged. Two of these were shot; each was a *M. fortidens*.

The evening flight of this species is rather slow. When hunting they fly from six to 12 feet above the ground, erratically, and with a fluttery wing beat. Those disturbed from their roosts in the thatch, however, came out of their retreats swiftly, and flew off into the jungle at high speed. Two of the seven found in the thatch were about one foot apart; the others were scattered, being 10 feet or more apart. The four specimens taken at this locality were all males.

No ectoparasites were noted on this species. A female from the Río Blanco had an embryo on May 13; one taken on May 29 was lactating.

#### *Myotis keenii auriculus* Baker and Stains

##### Keen's Myotis

Record.—Perote (Hoffmeister and Krutzsch, 1955:3). For the nomenclatural history of this subspecies see Findley (1960:16-20).

#### *Myotis thysanodes aztecus* Miller and G. M. Allen

##### Fringed Myotis

Record.—3 mi. ESE Las Vigas (Davis and Carter, 1962:72).

#### *Myotis volans amotus* Miller

##### Long-legged Myotis

Record.—Cofre de Perote, 12,500 ft., the type locality (Miller, 1914:212).

#### *Myotis californicus mexicanus* (Saussure)

##### California Myotis

Record.—Mirador (Miller and G. M. Allen, 1928:160). Seemingly the only record of occurrence in the literature of this species in Veracruz is provided by the holotype of *Vespertilio agilis* H. Allen (Proc. Acad. Nat. Sci. Philadelphia, 18:282, 1866) from Mirador. Miller and G. M. Allen (1928:159) placed *V. agilis* in the synonymy of the earlier named *V[espertilio]. mexicanus* of Saussure (1860:282), the type locality of which is not precisely known. Since Miller and G. M. Allen (1928) seem not to have been able to examine the holotype of *mexicanus* and did not make it absolutely clear that they carefully examined the holotype of *V. agilis*, which they list (1928:160) as in the Academy of Natural Sciences at Philadelphia, some doubt remains as to both the specific and subspecific identity of *Vespertilio agilis* and, therefore, also, whether the species *Myotis californicus* actually was obtained at Mirador.

*Myotis elegans* HallGraceful *Myotis*

*Specimen examined.*—One from 12½ mi. N Tihuatlán, 300 ft.

This small bat, recently named (Hall, 1962:163), is known from a single individual caught on September 24, 1961, in a mist net, by Percy L. Clifton.

*Myotis nigricans dalquesti* Hall and AlvarezBlack *Myotis*

*Specimens examined.*—Total 159: 4 km. W Las Vigas, 33; 13 km. WNW Potrero, 2000 ft., 1; 4 km. WNW Fortín, 3200 ft., 1; 2 km. N Motzorongo, 1500 ft., 1; 3 km. E San Andrés Tuxtla, 1000 ft., 7; 38 km. SE Jesús Carranza, 500 ft., 116.

This subspecies was named by Hall and Alvarez (1961:71).

On January 5, 1948, about 12 of these little black *Myotis* were found in a narrow crevice between a brick wall and a wooden door frame at the top of a door in a partly ruined house three kilometers east of San Andrés Tuxtla. Eight were captured, and later that night the crevice was examined, and two bats were seen. The remainder of the colony did not return to the crevice in the following four days. All eight of the specimens taken were males, with small testes well out on the uropatagium. There were two to four small, wingless flies on each bat.

Thirty-eight kilometers southeast of Jesús Carranza numerous small colonies of from 10 to 50 bats were found in small, vertical crevices in limestone cliffs. Some of these crevices were over water. The bats were not far back in the crevices; usually their heads were about an inch from the opening. The bats were tightly packed in the crevices.

In a large limestone cave (for description see account of *Balan-tiopteryx io*) there were eight colonies of from 50 to 100 bats of this species. The bats were tightly packed together at the bases of stalactites, 10 to 15 feet from the floor of the cave, and were in a constant state of agitation. The bats were in the back part of the cave, 100 to 200 feet from the cave mouth, where it was very dark. All were on the sides of stalactites nearest the mouth of the cave. One or two colonies were not actually seen; they were over pools of deep water and were located by the constant squeaking.

All of the bats taken at this locality on April 10 were females with embryos. Those taken on April 27 had large embryos or were nursing young. No males were found among the 120 bats saved.

A bat of this species was shot in flight two kilometers north of Motzorongo on December 11, 1946. My notes record: "For two nights I have seen a small bat over the pool of water in the arroyo



in the jungle here. It would arrive about 25 feet from the ground, make three or four circles about 30 to 50 feet in diameter, and vanish. . . . On the third night it came again, and I dropped it with a lucky shot. I did not find it until this morning. It was this species, *M. nigricans*. Ants had eaten the face somewhat, but the skull is perfect. It is a male with tiny testes—three by four millimeters. Other bats taken at the pool include: *Saccopteryx bilineata*, *Eptesicus [brasiliensis] propinquus* and *Carollia perspicillata*.”

*Myotis argentatus* Dalquest and Hall

Silver-haired *Myotis*

*Specimens examined*.—Two from 14 km. SW Coatzacoalcos, 100 ft.

This bat was found only once. On February 2, 1947, my companions and I were paddling a dugout canoe along one of the small, sluggish streams flowing into the Río Coatzacoalcos, 14 kilometers southwest of the city of Coatzacoalcos. I placed my hand on a dead stub, about eight inches in diameter and four feet high, to steady the canoe. The stub was riddled with termite- and other insect-holes, and in one such hole two bats were detected. One was an adult male; the other was a young female. The stub containing these bats was the limb of a tree that probably had fallen into the water. We searched in dozens of similar stubs, eroded by termites and sticking up from the water, but no other bats were found.

*Pipistrellus subflavus veraecrucis* (Ward)

Eastern Pipistrelle

*Specimens examined*.—Total 15: 4 km. E Las Vigas, 8500 ft., 14; 30 km. SSE Jesús Carranza, 300 ft., 1.

Additional records.—“Las Vegas [= Las Vigas?], Jalapa” (Miller, 1897:93).

On May 13, 1949, 30 kilometers south-southeast of Jesús Carranza, many bats, apparently all of the family Emballonuridae, as judged by the characteristic manner of flight, were noted here in the evening. About midnight, on this moonlight night, small bats of another kind were noted flying swiftly over the river and sandbar near our camp. After several attempts one was shot and it was an adult, non-pregnant female *Pipistrellus*.

Our largest series of this species was obtained in the caves four kilometers east of Las Vigas. This is the type locality of the subspecies (for description of these caves, see the account of *Myotis velifer*). Here we took bats of this species on January 15, 16 and 17. The bats were in hibernation at this time. They hung singly, well hidden, and usually one or two to a cave. A few were hanging from

the walls of the caves, in the open, but the greater number were found under ledges or in holes or crevices in the lava walls of the caves. All were near the floor of the cave; only one was found as high as seven feet from the floor and several were only about three feet from the floor. All were cold and torpid. After being handled, and after remaining about 10 minutes in the collecting bag, the animals became completely active. Several specimens were "frosted" with droplets of water, and seemed to have been hanging in the same place in the cave for some time.

### *Eptesicus fuscus miradorensis* (H. Allen)

#### Big Brown Bat

*Specimens examined*.—Total 3: 6 km. SSE Altotonga, 9000 ft., 1; 3 km. E Las Vigas, 8000 ft., 1; Potrero Viejo, 5 km. W Potrero, 1.

*Additional records*.—Las Vigas (Miller, 1897:100); 5 km. E Las Vigas, 8000 ft. (Davis, 1944:380); 5 km. N Jalapa, 4500 ft. (Davis, 1944:380); 3 mi. E Perote (Hooper, 1957:3); 4 mi. E Perote (Hooper, 1957:3); 1½ mi. S Perote (Hooper, 1957:3); Jico (Miller, 1897:100); Mirador, the type locality (H. Allen, 1866:287); Tuxpango (Miller, 1897:100); Tilapa (Sumichrast, 1882:201); Cuautlapa (*ibid.*).

The big brown bat is fairly common in the pine forests at high elevations in Veracruz, but is rare in the lowlands. In the pine forest north of the Cofre de Perote, in early November, 1946, one bat was taken six kilometers south-southeast of Altotonga, at 9000 feet elevation, and another three kilometers east of Las Vigas, at 8000 feet elevation. These bats flew rather slowly, in straight lines or large circles, about 25 feet above the ground. The nights were cold, probably about 40 degrees Fahrenheit, and no insects were noted in the air. The bats, however, were remarkably fat.

The one specimen that I obtained from the tropical parts of Veracruz was taken in the village square of Potrero Viejo, 1700 feet elevation. Mr. Dyfrig Forbes obtained permission from the local authorities to shoot on the square. Such a crowd gathered, however, that the bat could not be found after it fell; several days later Miss Marion Forbes found it and it is preserved as a mummy.

### *Eptesicus brasiliensis propinquus* (Peters)

#### Brazilian Brown Bat

*Specimens examined*.—Total 16: 4 km. NW Tuxpan, 5; Tuxpan, 2; 12½ mi. N Tihuatlan, 300 ft., 1; Potrero Viejo, 7 km. W Potrero, 1700 ft., 1; Potrero Viejo, 5 km. W. Potrero, 1700 ft., 2; Hacienda Potrero Viejo, 5 km. W. Potrero, 1700 ft., 1; Río Blanco, 20 km. W Piedras Negras, 400 ft., 2; 2 km. N Motzorong, 1500 ft., 1; Achotal, 1 (14150 Chicago N. H. Mus.)

This small bat is not uncommon in the lowlands of central Veracruz, but the daytime retreat of the species was never found by us.

In the stable yard at Hacienda Potrero Viejo on March 24, 1946, the bats emerged at dusk and flew for some time about a large mango tree, across the wall from the observer and near buildings. Later they came near the stables and flew rather low and excessively fast. One was shot. Two additional specimens were secured here, under similar conditions, on April 4, 1946. On October 24, 1946, a bat of this species flew into the window of a house at Potrero Viejo, and was saved. Another was shot under the overhanging branches of a tall mango tree along the Río Blanco, 20 kilometers west of Piedras Negras, on October 4, 1946, where two days before a *Saccopteryx bilineata* was killed. Another *E. b. propinquus* was shot under the same tree on October 6, 1946. Two kilometers north of Motzorongo, on December 9, 1946, one of these bats was taken by means of a wire strung over the pool in the arroyo. The area was jungle, with dense vegetation all about. Over the pool were vines and tall trees. Two *Saccopteryx bilineata* were obtained at the pool, and fruit-eating bats of several kinds were present. The Brazilian brown bat hit the wire about one-half hour after dark, and fell into the water with a splash. It swam well and swiftly.

***Lasiurus borealis teliotis* (H. Allen)**

Red Bat

Record.—Peñuela (Handley, 1960:472, regards *Lasiurus borealis ornatus* Hall, 1951, with type locality at Peñuela as indistinguishable from *Lasiurus borealis teliotis* H. Allen, 1891).

***Lasiurus seminolus* (Rhoads)**

Seminole Bat

Record.—Vicinity of Tecolutla (Villa, 1955:238; Málaga Alba and Villa, 1957:552).

Villa (1955:238) reported one specimen from Tecolutla on the verbal authority of Málaga Alba as *Lasiurus borealis seminolus* but Villa stated that he personally did not check the identification. We have not been able to locate the specimen.

***Lasiurus cinereus cinereus* (Palisot de Beauvois)**

Hoary Bat

*Specimen examined*.—One from 3 km. W Zacualpan, 6000 ft.

*Additional record*.—Jalapa (Ward, 1904:653).

***Lasiurus intermedius intermedius* H. Allen**

Northern Yellow Bat

*Specimens examined*.—Fifteen from 1 mi. SW Catemaco.

For an explanation of the subspecific status of this bat, see Hall and Jones (1961:84).

The 15 specimens mentioned above were dislodged on July 22, 1955, from the south and east sides of two tobacco sheds, along with 35 other individuals. The outside of the walls was thatched with corn stalks. The 15 individuals collected were four females having worn teeth, six females having unworn teeth and five males having unworn teeth. The four females having worn teeth were lactating. The other 11 were smaller and seemed to be young of the year (Baker and Dickerman, 1956:443).

*Lasiurus ega xanthinus* (Miller)

Southern Yellow Bat

*Specimen examined.*—Achotal, 1 (F.M.N.H. 14151). For use of the sub-specific name *xanthinus* instead of *panamensis* see Hall and Jones (1961:91).

*Nycticeius humeralis mexicanus* Davis

Evening Bat

*Specimens examined.*—Two from 4 km. NE Tuxpan. The bats were captured in a mist net at night.

*Rhogeessa tumida tumida* H. Allen

Little Yellow Bat

*Specimens examined.*—Total 12: 25 km. W Tampico, 2; 12½ mi. N Tihuatlán, 300 ft., 8; Boca del Río, 10 ft., 1; Río Blanco, 20 km. W Piedras Negras, 400 ft., 1.

*Additional record.*—Mirador, the type locality (Goodwin, 1958:3).

At Río Blanco and Boca del Río specimens were shot in flight on the arid coastal plain. They were present in small numbers, at dusk, flew more rapidly than *Saccopteryx bilineata* or *Eptesicus brasiliensis propinquus*, and maintained a distance of five to 12 feet above the ground. Individuals observed were partial to the shade of trees and boughs; they left the shadow of tree limbs for short periods, seemingly to catch insects, but usually returned at once to the shadows. A similar restriction to shadow was noted in *Saccopteryx bilineata*, but to a lesser extent. The specimens from 12½ mi. N Tihuatlán were found by a native in a hollow tree. Those from 25 mi. W of Tampico were caught between 7:00 and 8:00 p. m. in a mist net.

Nothing was learned of the breeding habits of this species in Veracruz, and no ectoparasites were found on the specimens taken.

*Plecotus mexicanus* (G. M. Allen)

Mexican Big-eared Bat

*Specimens examined.*—Total 77: 6 km. WSW Zacualpilla, 6500 ft., 3; 4 km. E Las Vigas, 8500 ft., 74.

Additional records.—Las Vigas (Ward, 1904:653 as *Corynorhinus macrotis*—probably was *P. mexicanus*); Jico [5,500 ft.] (Handley, 1959:151).

Handley (1959:141) has arranged this named kind of bat as a monotypic species instead of as a subspecies of *Plecotus (Corynorhinus) townsendii*.

On November 6, 1948, small caves and mine tunnels in the hills six kilometers west-southwest of Zacualpilla were searched for bats. In one narrow, low cave, situated beside a stream at the base of a hillside, sparsely forested with pine trees, we found two Mexican big-eared bats. They were 35 to 50 feet from the entrance of the cave, and were clinging to the wall, head down at a place where the cave was only about one meter in diameter. Both were cold and torpid, but not hibernating. They clung by means of their feet and thumbs, with the backs bowed and the heads against their chests. The long ears of this species were closely coiled and the tail was folded under the body, covering the abdomen. Two days later another bat of this same kind was taken in the same cave, 40 feet from the entrance.

A large series of *Plecotus* was obtained four kilometers east of Las Vigas in mid-January, 1949. The bats were found in caves in the basaltic lava at a small volcanic cone called Volcancillo. The greater part of our material from that locality was taken in shallow lava tubes, from one meter to three meters in diameter, and from a few inches to a meter or so beneath the crust of the lava flow. These bats were not hibernating. They were found clinging to the walls of these relatively small, dry caves from 25 to 500 feet from the entrances. Certain caves seemed to be favored over others, and by returning to these caves each day, we secured specimens from places where, a day earlier, we had removed all the bats.

In the much larger, deeper, caves in the same area, we found this species in hibernation. These larger caves were colder and damper than the shallow caves. The fur of the big-eared bats taken in the deep caves was damp or wet. Some individuals were seen, day after day, in the same place in these caves. One individual did not change position in a week. The hibernating bats were distinctly fat; those from the shallow caves were less fat and most of them were lean. In the deep caves we found also *Myotis velifer* and *Pipistrellus subflavus*. Only *Plecotus* was found in the shallow caves.

We have no records of embryos from this bat in Veracruz. The testes of the specimens examined were all small. A species of winged fly is the common parasite on *Plecotus*. Almost all of the specimens taken in Veracruz had several of these parasites.



## Family Molossidae

*Cynomops malagai* Villa

## Mexican Dog-faced Bat

Records (Villa, 1955:1-2).—Tuxpan de Rodríguez Cano, 20° 57', 97° 24', four meters; Veracruz [city of].

*Tadarida brasiliensis mexicana* (Saussure)

## Brazilian Free-tailed Bat

*Specimens examined*.—Total 26: 6 km. WSW Zacualpilla, 6500 ft., 9; Jalacingo, 6500 ft., 13; 4 km. WNW Fortín, 3200 ft., 1; Maltrata, 3 (U.S.N.M. 64340-64342 alcoholics).

Additional records.—5 km. E Las Vigas, 8000 ft. (Davis, 1944:380); 5 km. N Jalapa, 4500 ft. (Davis, 1944:380); Cofre de Perote, 13,000 ft. (Saussure, 1860:283); "Veracruz" (the state) (Shamel, 1931:5).

This is a common bat on the Mexican Plateau, where it seems to have taken the place of *Molossus ater nigricans*. We have only one specimen from the tropics, which may have strayed far from its normal range.

By searching for bat droppings on the ground beneath crevices, a small colony, six kilometers west-southwest of Zacualpilla, 6500 feet elevation, was found in a vertical crevice in a sandstone cliff in an arroyo. The base of the crevice was under an overhanging ledge, and was 15 feet from the ground. The bats were too far up in the crevice to see, and irregularities in the crevice made it impossible to shoot them. Accordingly the crevice was blasted open with dynamite, and nine bats were killed by the blast and subsequently recovered. One specimen did not fall to the ground until November 9 (the others were taken on November 6) and, as it was not decayed, we suppose that it had been wounded by the blast and died later. All of the individuals obtained were non-pregnant females.

On November 12, 1948, a large colony of Brazilian free-tailed bats was discovered in the Cathedral at Jalacingo. The bats were in crevices in the wooden roof of two narrow rooms, about 25 feet long and four feet wide, that extended from the floor of the cathedral up, parallel to the tower, to the ceiling of the cathedral, perhaps 75 feet above. Some of the bats were in shallow crevices, or in the angle between the roof and walls. The bats were semi-dormant, and by reaching from a small window in the tower wall, we knocked them loose from their perches with a pole. The bats opened their wings and being unable to fly sailed to the floor below, where they were placed in a collecting bag before they could become fully active. The specimens taken here included three males and ten non-pregnant females.

A male was obtained in the Tropical Life-zone, over a pool four kilometers west-northwest of Fortín on April 2, 1946, by placing a wire in the line-of-flight of bats that were drinking from the pool. Numerous specimens of *Molossus ater nigricans* were trapped in the wires over this pool.

### *Eumops glaucinus* (Wagner)

#### Wagner's Mastiff Bat

*Specimens examined*.—Jesús Carranza, 250 ft., 3.

In the town of Jesús Carranza on March 12, 1947, a wooden building was occupied by a colony of about 25 individuals of *Glossophaga*. "The day was hot and the attic was very warm. I climbed to the roof to get a better swing at the active, shy *Glossophaga* and noted the head of a molossid emerging from between two boards that overlapped loosely forming a crevice about three-quarters of an inch wide. I pulled the bat out. It did not attempt to escape, or struggle much, or make a sound. I reached in and pulled out two more, all rather torpid in spite of the heat." Several individuals of *Molossus ater nigricans* were also found in this building.

### *Molossus ater nigricans* Miller

#### Red Mastiff Bat

*Specimens examined*.—Total 117: Ozulama [=Ozuluama], 500 ft., 8; La Mar, 20 ft., 5; Tuxpan, 22; 12½ mi. N Tihuatlán, 300 ft., 6; Puente Nacional, 500 ft., 10; 4 km. W Paso de San Juan, 250 ft., 14 Río Atoyac, 8 km. NW Potrero, 16; 4 km. WNW Fortín, 3200 ft., 24; Potrero Viejo, 1700 ft., 3; 3 km. SE Orizaba, 3; Cosamalopán, 150 ft., 3; Jesús Carranza, 250 ft., 3.

*Additional records*.—San Andrés Tuxtla (Miller, 1913:88); Tuxpango (Sumichrast, 1882:202); Catemaco (Miller, 1913:88).

*Molossus ater* instead of *Molossus rufus* is the correct specific name for this bat according to Goodwin (1960:6).

The red mastiff bat is one of the most common of the insectivorous bats in the Tropical Life-zone of Veracruz. Colonies were found in buildings, in hollow trees, and in crevices in cliffs.

Four kilometers west-northwest of Fortín on March 26, 1946, bats were reported to inhabit the hollow of a large tree. The tree was of the slim species with broad leaves and red bark, called "palo mulato." It was about two feet in diameter at the base. Approximately 25 feet from the ground there was a scar where the tree had been hit by lightning. Above this scar the tree was hollow for an unknown distance. Bat guano had formed a pile at the bottom of the lightning scar and had washed down the trunk of the tree. There was also a small pile at the base of the tree. Eleven specimens of *Molossus ater nigricans* in the black phase, were obtained from the colony of about 25 bats that lived there.

At Puente Nacional on October 21, 1946, bats of this species were seen emerging from crevices in a sandstone cliff and from small openings in a concrete bridge [the "National Bridge"]. On October 22, the bridge was investigated. The bridge is very old, and is of the series-of-arches type. There were originally drainage holes below the rail-wall, about every 25 feet, but those of the east side have become filled, on top, with rocks and soil. The lower, outer, ends of most of the holes are covered by plants. Most of the bats were found in holes that were still open on the bottom but plugged above. By digging away the earth and sod from above, we got into the tops of the holes. The bats were not clinging to the walls, but were lying flat on the ground, under stones. It appeared as if they had burrowed back under the rocks, but I think it more likely that they had dug the holes by continual use, loosening bits of the sandy soil that tumbled down the holes to the river below. Some of the burrows were all of six by five by one inches, in the shape of a pocket. Eight bats, all in the black color phase, were taken here.

At four places (Jesús Carranza; three kilometers southeast of Orizaba; Ozuluama; and at Cosamolapán) this species was found in hot, dry, and dusty crevices in the attics of buildings.

We watched the flight of this species of bat on several occasions. Usually the bats left their hiding places about one and one half hours before dark, usually before swallows and other birds had retired for the night. On dark days, they emerged earlier. Shortly after they emerged from their retreats they began the evening hunt. Usually they flew high, about 150 feet above the ground, in the early part of the evening. At this elevation, they were independent of forest, cliffs, clearings, and other ground relief. As dusk advanced they flew lower and at about the time it became completely dark the bats were hunting at approximately 35 feet above the ground. At this elevation, they must maneuver through clearings and other roads and trails, avoiding the forest. Because they hunt at a much higher speed than most insectivorous bats, they are less able to twist and turn in the pursuit of insects, and require large clearings or long stretches of narrow clearings, such as the space above a road, river, or field.

These bats do not drink until it becomes completely dark. Then they approach a pool at an elevation, above its surface, of about 25 feet. Usually they fly over and past the pool and, when just past its farther bank, they dive, turn, and sweep back, skimming the

surface as they drink. They are easy to trap by stringing a wire an inch or so above the surface of the water. Approximately one half hour after complete darkness, the bats were seen returning to their retreats, and no specimens were taken in our wire traps more than one half hour after dark. Vespertilionid bats usually rest at night in some retreat other than their daytime roost. Red mastiff bats return to the daytime roost to rest at night.

These bats hunt also in the morning and often do not return until well after dawn. On several occasions we saw these bats returning to their roosts after the birds had been active for some time; perhaps one half hour after dawn. In the early evening and early morning, it is not unusual to see swallows and red mastiff bats hunting together.

Both males and females were found together in some colonies. Several times we found small groups of three to five males. Pregnant females were taken only in early spring: February 26, March 5, March 26, March 29, and April 5.

This bat has a strong, sweetish, musky odor, which seems to originate from the large gland in the chest. Commonly the fur of the chest is covered with the thin oil secreted by this gland. Several of these bats were fat, but most of the specimens were lean.

On November 24, 1946, one of these bats was flopping on the ground at the base of a tree, four kilometers west-northwest of Fortín, 3200 feet elevation. It was not wounded, but was unusually fat. The fur of the entire body was wet with the oil secretion from its chest gland which was soft and empty.

Beside the Río Atoyac, eight kilometers northwest of Potrero, at 1700 feet elevation, on March 1, 1946, a bat of this species was found hanging head-down from the weather-beaten post of an old, half-demolished dam across a small arroyo in the jungle. The bat was alive, but must have been ill, though no wounds were found on the body when the animal was skinned. At the same locality, on March 4, 1946, Mrs. Peggy Dalquest heard an animal squeaking in branches of a wild orange tree. When she turned the light from a flashlight into the tree, a bat dropped to the ground. The animal was a *Molossus* in the red color phase, and although apparently uninjured, it was not able to fly.

Parasites are rare on *Molossus ater nigricans*. Two species of mites were noted, a small red species and an even smaller yellow form. A small wingless fly was also noted.

## Order PRIMATES

## Family Cebidae

***Alouatta villosa mexicana* Merriam**

## Howler Monkey

*Specimens examined.*—Total 23: 10 km. NW Minititlán [= Minatitlán], 100 ft., 5; 35 km. ENE Jesús Carranza, 150 ft., 5; 20 km. E Jesús Carranza, 300 ft., 10; Arroyo Azul, 26 km. E and 8 km. S Jesús Carranza, 2; 35 km. SE Jesús Carranza, 400 ft., 1.

*Additional records.*—Pasa Nueva (Allen, J. A., 1904:40); Minatitlán (Merriam, 1902:67); Achotal (Lawrence, 1933:341).

In southern Veracruz, this species seems to live only at low elevations; our specimens were taken at elevations of between 100 and 400 feet. In the low, swampy jungles, near sea level, the howler was more common than the spider monkey. To the best of my knowledge, the spider monkey occurs wherever the howler does, but is found also in the higher areas, where the howler does not occur.

The howler is common in the low, dense jungles of broad-leaved trees and palms, as well as in the tall forest. We never saw monkeys on the ground, but on several occasions bands were found in small, isolated patches of jungle that they could have reached only by traveling over the ground.

Locally this species may be abundant. Normally it occurs in bands of from six to 50 individuals. In bands, females outnumber males by ten to one. Usually the spider monkeys and howlers remain separate, but in several bands of spider monkeys we noted a single howler. Such howlers that were shot were old males. One mixed band of about 100 spider and howler monkeys was seen.

Like the spider monkeys, the howler monkeys seem to feed principally in the early morning. They are commonly seen in the tops of tall trees throughout the day. Individuals sometimes remain motionless for hours. We have found what was probably the same band in the same general area on three consecutive days.

Howler monkeys are skillfull climbers but are far less active than the spider monkeys, and usually move through the trees rather slowly, although when frightened they are capable of swift movement. Their reactions differ from those of the spider monkey in many respects; howlers do not show the curiosity of the spider monkey. A man may walk along a trail beneath a band of howlers without becoming aware of their presence, unless they are moving about, breaking branches, or calling. When one member of a band is shot, the other monkeys usually hoot and roar, and move higher



into the trees. Rarely do they swing off through the trees, as the spider monkeys almost always do.

Like the spider monkeys, howler monkeys throw things at intruders, and are more apt to do so than spider monkeys. Usually their missiles are too small to be dangerous, and their aim is poor. Old males have powerful jaws and large teeth, and doubtless could give a serious bite. On one occasion two howlers were shot, but, as is often the case with howlers, the dead animals failed to fall from the trees, for the bodies were supported by the animals' death grip with feet, hands, and tails. The remainder of the band, approximately 10 animals, were in the tops of nearby trees. When the collector climbed into the tree to dislodge the dead animals, "the other animals started roaring and, I think, were preparing to attack me. I went down the tree in a hurry. One old male followed me to within 30 feet of the ground." Although these animals did not actually come within 10 feet of me, they did make faces, gape their tremendous jaws, and make loud, booming roars that were disconcerting to me, high in a jungle tree.

Twice we found howler monkeys at night. On the first occasion, the grating of our dugout canoe on a sandbar caused one animal to make a low hoot. The monkeys, about 25 in all, were sleeping in crotches well out on the limbs of a tree overhead. We were able to see them in the beams of our flashlights by looking for the black tails tightly wrapped around branches. At close range, their eyes, in the beam of a light, had a dull red glow. When the band was disturbed by our shooting, the survivors made off along the palm fronds and branches. A few hid in masses of vines. On another occasion the whistle from a passing railroad train caused a monkey to hoot. We found the band sleeping in a group of tall trees, on slender limbs about 50 feet from the ground. A porcupine (*Coendou mexicanus*) was shot from the same tree.

The call of this monkey is a hooting roar or a barklike, coughing howl. The sound travels for long distances, and can easily be heard for more than a mile. In the mornings the calls from many bands of these monkeys may blend together to form a constant roar. Later in the day they call less often, but they may call at any hour of the day. On dull and rainy days they call less than on bright, clear days. At some times of the year, especially in late March, April, and the first of May, they seldom call. The call is given by the females as well as by males, but the loud roar, which carries to a great distance, is made by the old males.

This monkey is never eaten in Veracruz, and we were told that they never bother crops. Two females taken on February 4, 1947, had newly-born young, but young of various ages are seen in most bands of this species of monkey, and we suppose that they have no regular breeding season in Veracruz.

Ectoparasites are not common on howlers. One old male had a number of large nematode worms in the rectum. Under the skin, several howlers had fly larvae described, in the field notes, as "brown; heavily ridged; about  $\frac{3}{4}$  inch long and  $\frac{1}{2}$  inch wide. They are only slightly flattened. They make a large lump on the animals, fully an inch in diameter. . . . [One animal had] some on the jaws, neck, chest, legs and feet."

### *Ateles geoffroyi vellerosus* Gray

#### Geoffroy's Spider Monkey

*Specimens examined*.—Total 41: 10 km. NW Minatitlán, 100 ft., 4; San Juan Evangelista, 3 (U.S.N.M.); Achotal, 7 (Chicago N. H. Mus.); 35 km. ENE Jesús Carranza, 150 ft., 4; 20 km. ENE Jesús Carranza, 200 ft., 1; 20 km. E Jesús Carranza, 300 ft., 18; Arroyo Saoso, 37 km. E, 7 km. S Jesús Carranza, 1; 20 km. ESE Jesús Carranza, 1; 35 km. SE Jesús Carranza, 400 ft., 2.

Additional records (Kellogg and Goldman, 1944:35, unless otherwise noted).—Barranca de Boca, Canton de Jalapa; Mirador (Reinhardt, 1873:150); 15 mi. NE Huatascos, 2000 ft.; Volcán de Orizaba (Elliot, 1905:535); Pasa Nueva: Cuatolapan.

According to the Rules of Zoological Nomenclature, *Sapojou* Lacépède is the correct generic name but the International Commission on Zoological Nomenclature (see Opinion 91) recommends the use of *Ateles*. The type locality of this subspecies is Mirador, Veracruz, by restriction. The spider monkey no longer occurs near Mirador, or elsewhere in central Veracruz. At Hacienda Mirador, 3500 feet elevation, on December 6, 1947, we were told by the elder members of the Grohman and Sartorius families that they had been told by their parents that monkeys once occurred there. There is still a pass to the northwest of Mirador that is called "Paso de los Monos" (Pass of the monkeys). The ancestors of the Sartorius and Grohman families were living in Hacienda Mirador when the collector, Sumichrast, obtained the specimens on which Reinhardt based the name *neglectus*.

This species once occurred in most or all of the forested parts of the Tropical Life-zone of Veracruz, but now is found only in the southern part of the state. I (Dalquest) saw individuals 15 kilometers southwest of Jimba in the Rincón area, and seven kilometers from Volcán San Martín Tuxtla.

In the lowlands of southern Veracruz, the spider and howler monkeys occur together in some localities. Where they occur together, the spider monkey is usually referred to as "mono" and the howler is usually referred to as "chango," but in some areas, this is reversed, the spider monkey being called chango. In higher areas,

where only the spider monkey occurs, it is called either *mono* or *chango*.

The spider monkey is usually found in tall, extensive forest, but in some places we found spider monkeys to be abundant where the jungle was only about 50 feet in height. Usually the spider monkeys live in rather humid forest, but in the Rincón area, to the west of Jimba, they were in dry, though tall and dense, jungle. Near the mouth of the Río Coatzacoalcos they were in swampy forest, and they were abundant in the dense, humid forest and limestone cliffs to the southeast of Jesús Carranza.

The spider monkey seems to be entirely diurnal. We never saw or heard the species at night. Usually spider monkeys and howler monkeys remain in separate bands. On March 20, 1947, 35 km. east-northeast of Jesús Carranza, however, a band of about 100 monkeys was composed of about equal numbers of each of the two kinds. On several occasions we found bands of spider monkeys, with a single old male howler in the group. In general, the spider monkey was more common than the howler in southern Veracruz, except near the Gulf, where the howler was the more common.

The spider monkey usually lives in small bands of from 10 to 25 animals. The largest band noted contained approximately 50 animals, but this was unusual. On several occasions we found pairs and single animals. One solitary animal was an old female. One pair consisted of an old female and a young male. Several small groups of old males were seen, usually numbering three to five animals. The larger bands include animals of both sexes, with the females outnumbering the males.

Spider monkeys feed in the early morning. By two to three hours after sunrise they are usually rather inactive, sitting in the tops of the larger trees. Some bands remained in the same tree most of the day. Under such circumstances they are exceptionally inquisitive, and will descend to the lower parts of the trees to examine any strange animal that passes. Their alarm call is a loud, rather bird-like, double squeak, "EEEEK-eeaaAAK," repeated endlessly. Spider monkeys, calling together, in a large band make a great racket. We have heard them call continuously for more than an hour. The sound, to me, is irritating. Young spider monkeys make a long, drawnout squeal.

Young spider monkeys are commonly sold as pets. Those that I saw were gentle and affectionate. They are captured by shooting the mothers, and climbing after the babies until they are caught or the trees containing the young are chopped down. We were told

by hunters that a baby would never leave the vicinity of its dead mother. Hunters told us also that on some occasions, when one monkey in a band was shot, the other monkeys would throw fruit and sticks and even large limbs at the hunters. We noted this habit only rarely, when monkeys were shot for specimens; the effort was rather half-hearted and the aim was poor. The howler monkey is more apt to throw things at an intruder than is the spider monkey. Almost invariably, when one or two spider monkeys of a band were shot, the others made off through the trees at high speed, leaving dead or injured animals to their fate. This is not true of the howler monkeys.

Except for the sale of young animals for pets, the spider monkey is of little economic importance in Veracruz. The flesh is never eaten. Dead animals have a strong and unpleasant smell. Even our dogs refused, at first, to eat the flesh. This odor was never detected from live animals kept as pets. These monkeys seem never to descend to the ground and they do not bother crops. The jungle fruits upon which they feed are rarely utilized by man.

The spider monkey has no regular breeding season. Young of various ages were seen in almost every large band examined. One man reported an albino spider monkey in the hills west of Jimba. Animals taken near Minatitlán in February had deep layers of yellow fat beneath the skin. Near Jesús Carranza, animals from some bands, young specimens as well as adults, were fat while animals from other bands in the same locality were lean. Parasites were rarely noted on spider monkeys, except that several animals had large fly-larvae in pockets under the skin. One old male had many nematode worms, about an inch long, in the rectum.

#### Family Hominidae

#### *Homo sapiens americanus* Linnaeus

#### Man

The native subspecies *H. s. americanus* has crossed extensively with the subspecies *H. s. sapiens* that invaded the area in the 16th century.

#### Order EDENTATA

#### Family Myrmecophagidae

#### *Tamandua tetradactyla mexicana* (Saussure)

#### Tamandua

*Specimens examined.*—Total 5: 20 km. ENE Jesús Carranza, 200 ft., 1; 20 km. E Jesús Carranza, 300 ft., 2; Arroyo Saoso, 37 km. E, 7 km. S Jesús Carranza, 1; 6 km. NW Paso Nuevo, 100 ft., 1.

Additional records.—“Passa Neuva” (Allen, J. A., 1904:394); Mirador (Hall and Kelson, 1959:239).

In Veracruz the four-toed anteater is usually called “brazo fuerte” but is referred to also as “oso hormiguero” and “chupa miel.” The species occurs from one end of the state to the other, in the Tropical Life-zone at lower elevations. Though widespread, this anteater is not common, probably because it is killed by man at every opportunity.

This species is both aboreal and terrestrial. In trees it is said to prefer dense growths, such as the mango. Terrestrial habitat includes open ground under dense jungle, marshy ground, and open, arid grasslands.

On February 9, 1948, at a place 20 kilometers east of Jesús Carranza, a large animal was heard moving on the ground at midnight. It made considerable noise in the dense jungle. A few moments later an anteater, the source of the disturbance, climbed up on one of the aerial roots of a large tree, and began to climb the tree.

At the same locality on March 21, 1948, an anteater was found about noon, on an exceptionally hot day, in the top of a small coyol palm tree, on a drooping frond about eight feet from the ground.

Six kilometers northwest of Paso Nuevo, an anteater was followed by dogs to its burrow almost in the center of an extensive area of tall sawgrass. The burrow had an entrance about 10 inches in diameter, was approximately two meters long and at its end was approximately a half meter below the surface of the ground. No nest was present, but the end of the burrow was slightly enlarged.

There are a number of superstitions regarding the anteater. One is that it reaches its long tongue into a nostril of a dog, and so strangles it. Another relates to the destruction of sugar cane. On the lower reaches of the Río Coatzacoalcos, the people insist that the frequent destruction of small patches of sugar cane by some animal that tears and chews the stalks is the work of the anteater. We obtained a specimen and were able to prove to them that this was not so. The mouth of the anteater is too small to bite with, it has no teeth, and the lower jaw is soft and flexible. Chewing anything as hard as sugar cane would be impossible for an anteater.

Anteaters are killed whenever found. One excuse for this is that the animals are a danger to dogs. They are also killed for their skin, which is said to be relatively stronger than that of an ox or horse. Most are killed, however, by hunters who find an anteater



in a burrow that they have worked diligently to open in the hopes of obtaining an armadillo.

We found no parasites on anteaters, not even ticks. The thick, tough hide may discourage ticks but the tapir in the same area is parasitized by a species of tick, in spite of its having an even thicker skin. Perhaps the strong, musky odor of the anteater is obnoxious to ticks.

None of the three anteaters taken was pregnant. What I took to be the salivary gland is worthy of mention because it is so greatly developed and enlarged as to extend back along the sides of the neck and then down, between the armpits, to the chest. When cut open it is seen to contain a thick, sticky, transparent liquid.

### *Cyclopes didactylus mexicanus* Hollister

#### Two-toed Anteater

Record.—Minatitlán (Hall and Kelson, 1959:240).

In the area of the Río Coatzacoalcos, this little anteater is called "mico de noche." It seems to be rare, and we were unable to obtain a specimen. A few skins for sale were seen in shoemakers' shops, but the locality of origin of such skins was uncertain. Animals are occasionally taken alive when large trees are cut down. One was said to have been kept alive as a pet at Minatitlán.

### Family Dasypodidae

### *Dasypus novemcinctus mexicanus* Peters

#### Nine-banded Armadillo

*Specimens examined*.—Total 8: San Carlos, 1 (Chicago N. H. Mus.); Río Blanco, 20 km. W Piedras Negras, 400 ft., 1; 15 km. SW Jimba, 750 ft., 1; 20 km. ENE Jesús Carranza, 200 ft., 1; 20 km. E Jesús Carranza, 300 ft., 1; 25 km. SE Jesús Carranza, 250 ft., 1; 35 km. SE Jesús Carranza, 400 ft., 1; 30 km. SSE Jesús Carranza, 300 ft., 1.

Additional record.—Jalapa (Ferrari-Pérez, 1886:130).

Armadillos from Veracruz can be separated from those seen from Texas and elsewhere in México by examination of the lacrimal bone. In the armadillo, this bone makes up the anterior, dorsal part of the zygomatic arch. In skulls from Veracruz, the lower, anterior suture is on the lower edge or side of the zygomatic arch, and is visible from the lateral view. In other armadillo skulls examined, the lower, anterior suture is below the angle of the zygomatic arch, on the ventral side, and is not visible from the lateral aspect. This character serves to separate both adult and young animals. Age in armadillos can be determined by the presence or absence of certain sutures between bones of the skull. We consider as adult,

animals having the sutures closed between the basiphenoid and the presphenoid, and between the basisphenoid and the basioccipital.

In addition, a skull from the Federal District is shorter and narrower than any from Veracruz and Texas. Two adults from Yucatán differ from other skulls examined, in that the presphenoid is much longer, extending forward beneath the palate as a long, pointed bone, and in that the greatest width of the braincase is at the squamosal, rather than at the suture between the squamosal and the frontal.

Specimens from the west coast of México have not been examined. Our material indicates but does not prove that specimens from Yucatán and Veracruz are subspecifically distinct from both *Dasypus novemcinctus mexicanus* and *D. n. texianus*.

In Veracruz, the armadillo is called both armadillo (pronounced armadeeo) and tochi. It is found throughout the Tropical Life-zone, and is everywhere hunted for food.

Favored habitat of the armadillo in Veracruz is dry jungle, either where the forest floor is open or covered with a tangle of vegetation. We found signs most abundant where the jungle was low but with a dense crown of branches, leaves and vines. As a result of the absence of sunlight in places of this kind, the ground beneath the trees was relatively open, and was littered with dry leaves. Dry ground seems to be preferred to damp ground, and level ground to rough ground.

Armadillos are not social. They are principally nocturnal; only one was seen abroad by day. Their eyes do not reflect the rays of a hunting light at night. As a result they are difficult to shoot at night. In the daytime they take refuge in burrows that they dig for themselves. A typical burrow was found 15 kilometers southwest of Jimba, after our dog began to bark a short distance from the trail. The brush and jungle were so dense that we had to chop our way by means of machetes in order to reach the dog. It was at the entrance to a burrow between two logs. The top log was so much decayed that we were able to cut it in two with our machetes; we moved the other log. The dog had enlarged the entrance of the burrow, and its original diameter could not be determined. When the dog was pulled away, we could hear the tochi scratching as it burrowed. We dug with our machetes, and within two feet found a mass of dry leaves—the nest. We could see the animal's tail, but it set its feet so securely in the earth that it took all of my strength to pull the animal from its burrow.

The armadillo is hunted by means of dogs especially trained for the work. In a good area, two hunters may catch as many as four armadillos in a day. The dog trails the animal to its hole, from which the armadillo is dug out. The flesh of the armadillo is held in great esteem. Correctly prepared, it is delicious, and resembles pork, but is sold for several times the price of pork or beef, in some areas. Only the agouti and paca are considered superior as food.

An armadillo taken on March 5, and another taken on April 24, each contained four large embryos. Large ticks are commonly found attached to the underside of the armadillo; each specimen examined had from 11 to 25 such ticks.

### Order LAGOMORPHA

#### Family Leporidae

#### *Sylvilagus brasiliensis truei* (J. A. Allen)

#### Forest Rabbit

*Specimens examined*.—Total 5: 35 km. NW Tuxpan, 1; Potrero Llano [= Potrero del Llano], 350 ft., 1; 12½ mi. N Tihuatlán, 300 ft., 1; 2 km. N Motzorongo, 1500 ft., 1; 30 km. SSE Jesús Carranza, 300 ft., 1.

Additional records (Nelson, 1909:264).—Mirador; Motzorongo; Otatitlán; Buena Vista.

The forest rabbit is probably common in the dense jungle of Veracruz, but we found it extremely difficult to obtain. In field notes for December 6, 1946, it is recorded that at a place two kilometers north of Motzorongo "One of these small, dark rabbits was taken last night. It was in a beautiful setting. There is a grove of tall banana trees in a clearing, about 100 feet square, chopped out of the jungle. The area is near the stream in the arroyo, and is level. It was probably cleared last year, and has come up in elephant's ear. Some leaves are five feet long. I was hunting here about one hour after dark. Fruit-eating bats were making considerable noise, but I heard something else moving in the vegetation. My light picked out the dull, red glow of a single eye, and I had to shoot it at rather close range." The specimen was a male with testes measuring 30 by 12 millimeters.

An adult male taken along the Río Solosuchil, 30 kilometers south-southeast of Jesús Carranza on May 13, 1949, was shot approximately two hours after dark, when it came to drink at a sandbar at the edge of the river. Back of the bar the jungle was tall and dense except for patches of wild banana and occasional deep tangles of vines and brush, and the ground was open and level.

An adult female that was nursing young was shot in dry, low, dense and thorny jungle at Potrero Llano, 350 feet elevation, on

February 15, 1949. Eastern cottontails were found in a large cornfield here, and while hunting for them we walked along the border of the clearing. The light was shone into the jungle, wherever the vegetation would allow us to do so. In one place, the light reflected the glow of the eyes of a rabbit. It was shot, and found to be *S. brasiliensis*. Two individuals of *S. floridanus* were shot in the clearing 50 feet away.

### *Sylvilagus floridanus*

#### Eastern Cottontail

The Eastern cottontail, known in Veracruz as "conejo," occurs in almost every part of the state. In the alpine meadows and brushlands of the high mountains, it occurs with the Mexican cottontail, *Sylvilagus cunicularius*, and in the deep jungle it occurs with the forest rabbit, *Sylvilagus brasiliensis*. It reaches its greatest abundance at lower elevations, in the extensive sugar cane fields and on the coastal plain. In these places, extensive grasslands and numerous thorny thickets offer ideal food and cover.

This Eastern cottontail is nocturnal and most of our specimens were shot while we were hunting at night with a headlamp. On dark and cloudy nights, the cottontails are not shy, and usually allow a hunter to approach within shotgun range. On clear, moonlit nights, the same animals are shy.

Locally, in ideal habitat, cottontails are abundant. While driving at night along roads through the sugar cane fields within a radius of seven kilometers of Potrero, as many as 10 cottontails to a mile were seen. On the coastal plain, near Piedras Negras, four to six were often seen on a night's hunt, but at most places they were far less common. In some places we obtained specimens only after many hours of hunting at night. A number of the specimens from the coastal plain were shot after they were flushed from thorny cover by dogs.

When abundant near habitations, cottontails commonly damage gardens, and may do great damage to sugar cane when the cane is small. Two kilometers north of Motzorongo we saw seven consecutive new shoots of cane, in one row, that had been cropped to the ground by a rabbit that we shot. Cornfields suffer heavily from the attacks of cottontails; stalks less than a foot high are commonly cut a few inches from the ground. In some areas we found whole fields in which almost every stalk had been cut by rabbits.

This cottontail is an important item of food and furnishes much sport in Veracruz. The cottontail and the chachalaca, in many parts

of the state, are the only common wild species of game. The flesh of the cottontail is far less desirable than that of the paca and armadillo, but the cottontail is much more easily obtained than those species.

No pregnant females were obtained in Veracruz. Females that were nursing young were taken on May 27, February 12, and February 28. A male with greatly swollen testes was taken on December 5. A juvenile only 184 millimeters in total length was taken on December 17.

Most specimens had a few ticks, and some had many small ticks, but the infestations were small, considering the large numbers of ticks in the country that the cottontails inhabit. Several cottontails had a few fleas. One specimen had a fly larva under the skin on one side of the neck.

#### *Sylvilagus floridanus connectens* (Nelson)

*Specimens examined*.—Total 35: Hacienda Tamiahua, Cabo Rojo, 2; Ozulama [= Ozuluama], 500 ft., 3; Ixcatepec, 70 km. NW Tuxpan, 1; Tlacolula, 60 km. WNW Tuxpan, 2; Potrero Llano, 350 ft., 2; 50 km. NW Tuxpan, 2; 4 km. N Tuxpan, 1; 9 km. E Papatla, 300 ft., 1; Teocelo, 4000 ft., 1; 3 km. W Boca del Río, 10 ft., 1; 7 km. NW Potrero, 1700 ft., 2; 5 km. NW Potrero, 1500 ft., 1; Potrero Viejo, 1700 ft., 8; 15 km. W Piedras Negras, 300 ft., 2; Río Blanco, 20 km. WNW Piedras Negras, 5; 2 km. N Motzorongo, 1500 ft., 1.

Additional records (Nelson, 1909:186).—Jico; Chichicaxtle, type locality; Mirador; Orizaba.

#### *Sylvilagus floridanus orizabae* (Merriam)

Records (Nelson, 1909:185).—Las Vigas; Mount Orizaba.

#### *Sylvilagus floridanus russatus* (J. A. Allen)

*Specimens examined*.—Total 6: Jimba, 350 ft., 2; 7 km. NW Paso Nuevo, 100 ft., 2; 14 km. SW Coatzacoalcos, 100 ft., 2.

Additional records (Nelson, 1909:187).—Catemaco; Coatzacoalcos; Minatitlán; Pasa Nueva, type locality.

#### *Sylvilagus audubonii parvulus* (J. A. Allen)

##### Desert Cottontail

Record.—Perote (Nelson, 1909:237).

#### *Sylvilagus cunicularius cunicularius* (Waterhouse)

##### Mexican Cottontail

*Specimens examined*.—Two from 3 km. W Acultzingo, 7000 ft.

Additional records (Nelson, 1909:241).—Las Vigas; Perote; Cofre de Perote; Orizaba.

On October 7, 1947, three kilometers west of Acultzingo, a small boy told us that he had seen a rabbit enter a hole. The burrow was excavated and a Mexican cottontail, a young, non-pregnant female,



was captured. The burrow was about five inches in diameter, four feet long, and at its end two feet beneath the surface of the ground. There was no nest. At the same locality, on December 5, 1948, several Mexican cottontails were found with the aid of dogs, and one, an adult male, was obtained. No ectoparasites were found on it or on the young female.

In the winter of 1948-1949, at Las Vigas, Mexican cottontails were hunted on many nights. The animals were fairly common in the cool, damp meadows of zacatón and in thickets of brush on the mountainside nearby. The heavy fog, which occurs almost nightly at this elevation in the winter, greatly hampered us in our efforts to obtain specimens. No rabbits were seen in the early morning or daytime. Twice we found where some predator, probably a fox, had killed a rabbit the night before.

Order RODENTIA

Family Sciuridae

*Spermophilus perotensis* Merriam

Perote Ground Squirrel

*Specimens examined*.—Total 8: Perote, 7500 ft., 1; 2 km. E Perote, 7000 ft., 1; 2 km. W Limón, 7500 ft., 6.

Additional records (Davis, 1944:383).—Perote, 8300 ft.; Guadalupe Victoria.

This ground squirrel is called "moto" in the Perote area. In early October, 1947, we searched for ground squirrels near Perote, but most of them had gone into hibernation. One old female, that had been nursing young, was taken two kilometers east of Perote on October 13. It was fat, and had no ectoparasites.

In early October of 1948, a small series of specimens, principally young animals, was obtained in the same general area. All were fat. Two fleas were noted on the specimens taken.

*Spermophilus variegatus variegatus* (Erxleben)

Rock Squirrel

No specimens of this species were obtained in Veracruz, nor has the species been taken by other collectors. I saw two individuals in Veracruz. One was shot at and wounded on November 20, 1946, as it sat on the wall of an old ruin, seven kilometers west of Acultzingo, 7000 ft. elevation. The animal escaped and presumably died. A week was spent in the vicinity, but no other was seen. This locality is on the lip of the Mexican Plateau, about one kilometer from the Puebla boundary. Another specimen was seen on Octo-

ber 11, 1947, on the extensive lava flow, three kilometers west of Limón, 8000 feet elevation. This locality also is about one kilometer from the Puebla boundary.

### *Sciurus deppei*

#### Deppe's Squirrel

In Veracruz this little squirrel is generally known as "ardilla montañera," or "ardilla chica." It lives in deep forest of broad-leaved trees, and prefers the dense jungle, where there is but little light. In tall forest it often occurs with the red-bellied squirrel, but seems never to enter the open palm-jungles, where the red-bellied squirrel is often common. Near the type locality, as at three kilometers west of Gutierrez Zamora, Deppe's squirrel was common in dense forest, the trees of which were seldom more than 30 feet in height or five inches in diameter at the base. Here the overhead vegetation was so dense that the ground beneath was only dimly lighted.

This species was never seen to enter holes in trees, but it probably does so. Leaf nests are common. Most nests that we were reasonably certain were of this species were about 12 inches in diameter and placed on larger limbs not less than 25 feet from the ground. Some were on slender main trunks, not far from the tops of trees.

Locally these little squirrels are abundant, but seem not to be social to any degree. They differ greatly from the red-bellied squirrel in their actions, in that they spend considerable time on the ground, are rather slow, and in trees move with little disturbance, rarely rustling leaves and branches. They usually are found on the tree trunks and larger branches. At the approach of a hunter, they slip around to the far side of a trunk or large limb, and remain motionless. Most attempts to "wait them out" failed. The most successful method of hunting them was that of moving steadily and slowly through the gloom of the deep woods, and watching carefully the main trunks and larger limbs 20 to 40 feet from the ground. There the squirrels could be seen in silhouette against the leaves overhead.

Nine kilometers east of Papatla we were told that on two hills, separated by only a few hundred yards of low, forested valley, the squirrels were different. Our own investigation confirmed this for on one hill only *deppei* was found whereas only *aureogaster* was found on the other hill. On other nearby hills, both species were found together. We can offer no explanation for this distribution.

On the slopes of Volcán San Martín Tuxtla, at 3000 feet elevation, a number of these squirrels were found on the ground in the early morning. A steady rain was falling, and we were hunting with the aid of dogs. Perhaps 10 little squirrels were flushed by the dogs. Some ran along the ground for several yards, not taking to the trees until closely pressed by the dogs. Because we were searching for larger animals, we shot only two Deppe's squirrels.

In the dense jungles at low elevation, to the east and south of Jesús Carranza, in extreme southern Veracruz, the little brown squirrel was abundant. It was found in the deepest part of the forest, where most of the trees were more than 100 feet high but most of the squirrels were seen on or near the ground; not one was noted more than 50 feet from the ground. They seem to prefer the trees that were heavily hung with vines, and trees with numerous cavities, such as the strangler fig.

These squirrels are of little economic value; they are too small to be worth hunting for food. The cost of the ammunition is greater than the value of their meat. They rarely come into contact with agriculture, but when they do so, are capable of doing great damage, especially to corn. This occurs where a milpa (cornfield) is situated in a clearing in dense forest. The squirrels climb the stalks, and without detaching the ears of corn, cut away the husks to reach the kernels. They begin to gnaw at the tip, and rarely eat more than half the kernels of one ear. It is a common sight, in such a milpa, to see ears of corn, half-eaten, with the bottom of the ear still swathed in its husks, but several inches of the bare cob, from which the corn has been eaten, projecting.

None of the females of this species that we examined was pregnant. Males having enlarged testes were taken in November, March and April. No parasites were recorded on this squirrel.

### *Sciurus deppei deppei* Peters

*Specimens examined*.—Total 55: 12½ mi. N Tihuatlan, 300 ft., 2; 9 km. E Papantla, 300 ft., 8; Zacualpan, 6000 ft., 1; 3 km. W Guttierrez [= Gutierrez] Zamora, 300 ft., 2; San Carlos, 4 (Chicago N. H. Mus.); 4 km. W Tlapacoyan, 1700 ft., 1; Dos Caminos, km. 354, alt. 4500 ft., 1 (Chicago N. H. Mus.); 7 km. SE Volcán San Martín Tuxtla, 3000 ft., 2; Achotal, 1 (Chicago N. H. Mus.); 20 km. ENE Jesús Carranza, 200 ft., 2; 20 km. E Jesús Carranza, 300 ft., 3; Arroyo Saoso, 37 km. E, 7 km. S Jesús Carranza, 2; 20 km. SE Jesús Carranza, 250 ft., 1; 25 km. SE Jesús Carranza, 250 ft., 3; 35 km. SE Jesús Carranza, 350 ft., 9; 30 km. SSE Jesús Carranza, 300 ft., 2; 60 km. SE Jesús Carranza, 450 ft., 1.

Additional records (Nelson, 1899:104).—Papantla, type locality; Las Vigas; Jalapa; Jico; Cordova [= Cordoba]; Montzorongo; Catemaco.

**Sciurus deppei negligens Nelson**

*Specimens examined*.—Platón Sánchez, 800 ft., 6.

**Sciurus aureogaster**

## Red-bellied Squirrel

This squirrel is unusually variable in color. Over all of Veracruz it is referred to as "ardilla," but the black phase is "ardilla negra," and the colored phase is "ardilla pinta." Most of the residents consider these color phases to be separate species.

The subspecies *frumentor* seems to be restricted to the pine forest of the mountains along the western border of the state. The habitat of the subspecies *aureogaster* is much more varied, and it is found in forests and jungles throughout the Tropical Life-zone of Veracruz. It probably reaches its maximum abundance in the tall, cool forests of the upper humid division of the Tropical Life-zone, at from 1500 to 4000 feet elevation. Where there are forests in the lower arid division of the Tropical Life-zone, as along streams and arroyos, this species is locally abundant. In the dense jungles of the extreme southern part of the state, the red-bellied squirrel is relatively scarce, as compared with farther north.

This diurnal species is far more active in the early morning than at other times of day. It probably lives in holes in trees, at least at times, but only one was seen to enter a hole. Leaf nests are commonly built. These are rather small nests for such a large squirrel. Most of the nests examined were from a foot to 18 inches in diameter; many were less than 35 feet from the ground. Opossums also utilize these nests. Nests in the lowlands were constructed principally of leaves of broad-leafed trees, with some twigs for strength. Nests of the subspecies *frumentor* were found in tall pine trees, were constructed of pine twigs and needles, were about 14 inches in diameter, and were placed 20 to 35 feet from the ground. No more than three individuals of this species were seen together, although several nests are commonly found within sight of each other in a small area.

The red-bellied squirrel is almost entirely arboreal. On a few occasions, we saw individuals descend to the ground to escape danger, but we never saw them feeding on the ground. They were often seen in low trees and bushes. Some hung head-down, by their back feet, from bushes as they fed on fruit at the ends of small twigs. Mostly, however, they live from 20 to 40 feet from the ground, but often higher. One, that was frightened at my ap-

proach, in a large tree, ran to the top of the tree and out along a branch, where it lay flat, parallel to the branch, fully 100 feet from the ground. It remained there as long as I watched. Had I not seen it hide, it would certainly have escaped notice. Although squirrels of this species are skillful climbers and are able to travel rapidly through the trees, they ordinarily do not make long leaps from one branch to another. One leap that spanned about five feet was the maximum observed.

Among the better known fruits on which this squirrel feeds are: mango, wild green figs, jobo plums, tamarind pods, and chico zapote. Numerous other species were eaten, as described in our notes, but the plant species were not identified.

The subspecies *frumentor* normally eats seeds of the pine and other conifers as at Las Vigas where we saw numerous cores of pine cones from which the nuts had been eaten. In this area the red-bellied squirrel does much damage to corn. We were shown dozens of ears of corn, partly eaten and dragged back into the pines, by these squirrels. At least five per cent of the corn in one field had been taken by the squirrels. In the lowlands, the red-bellied squirrel may locally damage cornfields, but usually the squirrel is content with wild fruits.

In the highlands, the red-bellied squirrel is esteemed for food, and is hunted for that reason as much as to protect the cornfields. In the lowlands it is almost never eaten, and never, so far as known, is it hunted for sport. The standard of living of the people of the lowlands is generally higher than in the highlands, and more desirable game species are abundant in the jungle.

In the hills near Potrero, only the colored phase was seen. In extreme southern Veracruz, to the south and east of Jesús Carranza, all but about two per cent of the red-bellied squirrels seen were black. On the Río Blanco, west of Piedras Negras, the two color phases were found in about equal numbers.

A female containing two nearly full-term embryos was taken on March 3. A male, taken on January 9, had greatly swollen testes. Common parasites are large, leathery ticks. When present, these are almost always on the head and neck. Many of these squirrels are parasitized by fly warbles. In the lowlands, almost every squirrel obtained had warbles, or the scars of warbles, and as many as three were found on a specimen. Usually they were on the back, from between the shoulders to the rump. Less often they were on the abdomen; one male had been emasculated by a larva.



Two squirrels were shot that had large parts of their tails missing. The stubs had completely healed.

*Remarks.*—Kelson (1952:247) studied subspeciation in *Sciurus aureogaster* and recognized two subspecies. One, *S. a. aureogaster*, is characterized by a great amount of variation in color, color patterns and relative dimensions of the skull, and is widely distributed in Veracruz. Kelson states that the only evidence of geographic variation that he could detect was a slight increase southwardly in frequency and degree of melanism. He chose not to ascribe much taxonomic significance to this increase in melanism. The specimen (82965) from farthest north in Veracruz is from Hacienda Tamiahua and was not seen by Kelson. It has more white than any other specimen from Veracruz.

Kelson makes this statement about the other recognized subspecies: “. . . although the essential morphological characters of *S. a. frumentor* occur sporadically in other populations, the animals from the higher elevations above Jico and Las Vigas are notably homogeneous, differ collectively from surrounding populations, and occupy a logical geographic range. Therefore, *S. a. frumentor* is retained as a tenable subspecies, and [all other heretofore named variants] . . . are referred to *S. a. aureogaster*.”

All of our specimens with one exception are referred to *S. a. aureogaster* on geographical grounds. The one specimen referred to *S. a. frumentor* was obtained three kilometers east of Las Vigas. Davis (1944:384) reported a specimen from the Cofre de Perote and referred it to *S. a. aureogaster*. In deference to Kelson's (*op. cit.*) later taxonomic treatment of this species, this occurrence that was recorded by Davis is here tentatively listed under the subspecies *S. a. frumentor*.

### *Sciurus aureogaster aureogaster* Cuvier

*Specimens examined.*—Total 75: 1 mi. E Higo, 500 ft., 1; Hacienda Tamiahua, Cabo Rojo, 1; 35 km. NW Tuxpan, 1; Platón Sánchez, 800 ft., 3; 17 km. NW Tuxpan, 2; 12½ mi. N Tihuatlán, 300 ft., 2; 5 km. S Tehuatlan [= Tihuatlán], 700 ft., 1; 4 km. E Papantla, 400 ft., 1; 9 km. E Papantla, 300 ft., 1; 3 km. SW San Marcos, 200 ft., 2; San Carlos, 2 (Chicago N. H. Mus.); Plan del Río, 1 (Chicago N. H. Mus.); Río Atoyac, 8 km. NW Potrero, 13; 7 km. NW Potrero, 1700 ft., 4; Río Blanco, 20 km. WNW Piedras Negras, 6; Río Blanco, 20 km. W Piedras Negras, 400 ft., 5; 15 km. W Piedras Negras, 300 ft., 2; 2 km. N Motzorongo, 1500 ft., 1; 3 km. E San Andrés Tuxtla, 1000 ft., 2; 5 mi. S Catemaco, 1; 14 km. SW Coatzacoalcos, 100 ft., 1; 10 km. NW Minititlán [= Minatitlán], 100 ft., 1; Jimba, 350 ft., 1; Achotal, 13 (Chicago N. H. Mus.); 35 km. ENE Jesús Carranza, 150 ft., 2; 20 km. ENE Jesús Carranza, 200 ft., 2; 20 km. E Jesús Carranza, 300 ft., 3.

Additional records (Nelson, 1899:42-44, unless otherwise noted.)—Papantla; 5 km. N Jalapa, 4500 ft. (Davis, 1944:384); Jalapa; Jico; Chichicaxtle; Puente Nacional, 500 ft. (Davis, 1944:384); Mirador; Orizaba; Motzorongo; San Andrés Tuxtla; Catemaco; Otatitlán; Coatzacoalcos; Minatitlán.

**Sciurus aureogaster frumentor** Nelson

*Specimen examined*.—One from 3 km. E Las Vigas, 8000 ft.

Additional records (Nelson, 1899:46, unless otherwise noted).—"Near" Las Vigas; N slope Cofre de Perote, 10,500 ft. (Davis, 1944:384—as *S. a. aureogaster*); "above" Jico.

**Sciurus oculus oculus** Peters

## Peters' Squirrel

Records (Nelson, 1899:89).—Las Vigas; Cofre de Perote.

**Glaucomys volans herreranus** Goldman

## Southern Flying Squirrel

Records.—Mountains of Veracruz, the type locality of the subspecies *G. v. herreranus* (Goldman, 1936:463); Los Pescados, Cofre de Perote (Hooper, 1952:110).

## Family Geomyidae

**Thomomys umbrinus**

## Southern Pocket Gopher

**Thomomys umbrinus albigularis** Nelson and Goldman

*Specimen examined*.—One from 2 km. N Los Jacales, 7500 ft.

Our adult female has no white on the throat or midline of the venter but neither does a female topotype of *T. u. albigularis*. Longer hind foot (29 mm.) and less of, and fainter, ochraceous on the sides of the neck on the specimen from Veracruz are the only features not duplicated in specimens from the type locality of *T. u. albigularis*.

**Thomomys umbrinus umbrinus** (Richardson)

Record.—Boca del Monte (Bailey, 1906:6).

**Heterogeomys hispidus**

## Hispid Pocket Gopher

The hispid pocket gopher, like other species of pocket gopher, is called "tuza" in Veracruz. It seems to be confined to the Tropical Life-zone. Usually gophers of this kind are found in clearings, either natural or artificial, but are found also beneath trees in the forest and jungle. In especially favored habitat they become locally abundant, but usually are not common. We found them in greatest abundance in the sugar cane fields of the upper humid division of the Tropical Life-zone, and in cornfields on the arid coastal plain.

Burrows of this species are usually large—in sand or loose soil they are as much as four inches in diameter. In firm, packed soil they are smaller. Mounds are usually small, and contain less than

a cubic foot of earth. Burrows are plugged at a distance of from one to two feet from the mound. The gophers are principally nocturnal. In places, however, we have seen and heard them feeding by day. None was taken in traps set in the daytime, however.

At times these gophers wander about on the surface of the ground. On December 6, 1946, two kilometers north of Motzorongo, a gopher was found shortly after midnight and my (Dalquest's) field notes of the next day read as follows: "Last night, returning from a hunt, along a trail, I heard a strange clicking, rattling noise at my feet. I looked down and saw a gopher, reared back on its hind legs, with front legs back between the hind legs, and head up, chattering at me. It looked as if it were actually looking for trouble. It could easily have escaped. It is a male of medium size (343 mm.). Its testes are large—15 by 9 mm., and probably in breeding condition. It seems to be healthy and normal." A young male of this species was taken under similar circumstances at about midnight on February 10, 1947, 14 kilometers southwest of Coatzacoalcos.

This species of gopher inhabits some of the most important agricultural land in México, and its depredations on crops are serious. On the south bank of the Río Blanco, 20 kilometers west-northwest of Piedras Negras, on May 14, 1946, we found gophers to be numerous in the cornfields. "So numerous are the mounds that it appears as if the ground had been ploughed." Gophers regularly take about one-fifth of the corn crop in that area. Near Potrero, this species of gopher is abundant in some sugar cane fields. Mr. Dyfrig Forbes, manager of a large plantation, states that about 50 per cent of the cane is destroyed, in some fields, each year. This is an average loss of some 22 tons of cane to a hectare, or (at 1947 prices and exchange) about 300 pesos (60 dollars) per hectare. Control by poison, gas, and traps, is only moderately effective. Two kilometers north of Motzorongo, banana trees were seen that had fallen to the ground because gophers had cut the roots and undermined the trees. About 15 trees had fallen in one grove, as a result of gophers' activities.

The ability of these gophers to live away from fields means that they can probably never be completely eradicated. Where we found workings of gophers common on the south bank of the Río Blanco, in May, 1946, mounds were conspicuous only in the cornfields. In the extensive grassy plain surrounding the fields, mounds were rarely seen. When the grass was burned away, hundreds of new mounds were formed on the plain. The gophers were not de-

stroyed by the fire. The mounds of white sand were conspicuous on the blackened ground. In two days in a small area near our camp more than 100 new gopher mounds appeared in an area that we had not previously been aware was inhabited by gophers.

The hispid pocket gopher seems to breed throughout the year. We took a young animal on March 13, nursing females on March 31 and October 5, a female containing two large embryos on November 23, and a young male on December 5. No parasites were found on gophers of this species save at three kilometers east of San Andrés Tuxtla, 1000 feet elevation. There the gophers were heavily infested with small mites. The stomach of a spectacled owl shot at Motzorongo, 1500 feet elevation, on December 6, 1946, contained the remains of a hispid pocket gopher.

### *Heterogeomys hispidus hispidus* (Le Conte)

*Specimens examined.*—Total 12: 4 km. W Tlapacoyan, 1700 ft., 2; 5 km. N Jalapa, 4500 ft., 1; 4 km. WNW Fortín, 3200 ft., 2; Potrero Viejo, 7 km. W Potrero, 1700 ft., 1; Potrero Viejo, 5 km. W Potrero, 1; 3 km. N Presidio, 1500 ft., 2; 2 km. N Motzorongo, 1500 ft., 1; Motzorongo, 1; 5 mi. SE Lerdo de Tejada, 1.

Additional records (Merriam, 1895:183).—Jico; Huatusco; Necostla [= Necoxtla].

The specimens, in the Museum of Natural History of the University of Kansas, of *Heterogeomys hispidus* from central and southern Veracruz were studied by W. W. Dalquest who wrote as follows concerning the subspecies *H. h. hispidus*: Specimens from Jalapa, Tlapacoyan, and Fortín are typical *hispidus*. Specimens from Potrero, Presidio, and Motzorongo are intermediate between *hispidus* and *torridus* and could almost as well be placed with one subspecies as with the other. These specimens are from the upper humid division of the Tropical Life-zone, although from the lower edge of it.

Approximately 10 years later Hugh B. House studied the same material and wrote as follows: On geographical grounds, the specimen from 5 km. N Jalapa is referable to *H. h. hispidus*. Indeed, it is from the area of the type locality for the subspecies, which is designated as "near Jalapa" (Merriam, 1895:181). On anatomical grounds, as set forth by Merriam (*op. cit.*) for what he considered to be a separate species, our specimen seems to be referable to *H. h. torridus*. However, juxtaposition of temporal impressions dorso-medially on the skull, a character used by Merriam to distinguish *H. h. torridus*, is found in specimens in our collection from many parts of the range of the species. Instead of being correlated with geography, the condition seems to be associated with large size and general angularity of the skull, and in some places with relatively great age, independent of sex. This seems to apply to many of the cranial distinctions made between *H. h. hispidus* and *H. h. torridus*. Furthermore, *H. h. hispidus* is supposedly characterized by the presence of a ridge or point on the auditory bulla extending toward the hamular process of the pterygoid. The only specimens found which lacked this formation are from the geographic range of this subspecies, whereas it was found on all specimens examined of the subspecies *H. h. torridus*, supposedly characterized by the absence of this

spine. Disposition here of our series of specimens from Veracruz among the various subspecies reported follows that by Dalquest and as far as I can tell was made largely on a geographical basis.

### *Heterogeomys hispidus isthmicus* Nelson and Goldman

*Specimens examined*.—Total 20: Tula, 7 (U. S. N. M.); 5 mi. SE Lerdo de Tejada, 7; 3 km. E San Andrés Tuxtla, 1000 ft., 4; 14 km. SW Coatzacoalcos, 100 ft., 1; Jesús Carranza, 250 ft., 1.

Additional records (Nelson and Goldman, 1929:150).—Catemaco; Jaltipan.

Notes made by W. W. Dalquest are as follows: "Our specimens from the Tuxtla Mountains are not typical of *isthmicus*. Except in slightly smaller size they resemble typical *hispidus*, but are isolated from that subspecies by the lowlands that, I suppose, are inhabited by the small and relatively hairless *H. h. torridus*. Nelson and Goldman (1929:150) referred a specimen from Catemaco, in the Tuxtla Mountains, to *H. h. isthmicus* and until more material is available from the Isthmus of Tehuantepec it seems best to apply that name to the gophers from the Tuxtla Mountains."

Hugh B. House approximately 10 years later studied the same material and in manuscript wrote as follows: "Nelson and Goldman (1929:149) named *H. h. isthmicus* and distinguished it from other subspecies (1929:150) by the 'abrupt median, crescent-shaped, forward deflection of the lambdoidal crest.' This characterization holds up only fairly well in our series and cannot be considered diagnostic."

The geographic location of a specimen of this species from Jesús Carranza is such that it might be an intergrade between the subspecies *H. h. tehuantepecus* and *H. h. isthmicus* but since it is immature it is of little taxonomic worth.

### *Heterogeomys hispidus latirostris* Hall and Alvarez

*Specimens examined*.—Total 3: Hacienda El Caracol, Tamós, 2 (U. S. N. M. 159499, 159500); Hacienda Tamiagua, Cabo Rojo, 1.

For this subspecies that is not in Hall and Kelson (1959) see Hall and Alvarez (1961:121).

### *Heterogeomys hispidus torridus* Merriam

*Specimens examined*.—Total 13: 4 km. N Tuxpan, 1; 12½ mi. N Tihuatlán, 300 ft., 8; 3 km. W Guttierrez [= Gutierrez] Zamora, 300 ft., 1; Río Blanco, 20 km. WNW Piedras Negras, 2; 15 km. W Piedras Negras, 300 ft., 1.

Additional records.—Chichicaxtle (Merriam, 1895:184); 4 km. S Veracruz, 30 ft. (Davis, 1944:388); Boca del Río, 10 ft. (Davis, 1944:388).

### *Heterogeomys lanianus* Elliot

#### Big Pocket Gopher

This species is known from a single specimen taken at Xuchil.

### *Cratogeomys perotensis*

#### Perote Pocket Gopher

This large pocket gopher is called "tuza" in Veracruz, as are all pocket gophers. In some areas it is called "tuza de tierra." It seems to be confined to the pine forest of the mountains. We found it in



the cool, humid meadows of zacaton grass on the Cofre de Perote, and in cornfields in the arid, lava-flow area at Las Vigas. Although its range lies entirely within the pine forest area, this gopher is not found in the forest itself, but rather in openings, natural and artificial, in the forest. Near Las Vigas we found mounds of pocket gophers principally in cornfields, or in fields that had been planted to corn the year before. Residents told us that the gophers were concentrated in the cornfields. Corn has, it should be remembered, been grown in the area occupied by this gopher for hundreds of years.

We caught this species only at night, although traps were often left in the burrows during the day. Near Las Vigas, burrows were about three inches in diameter and constructed through firm, black soil, and soft, red earth. On the Cofre de Perote and the area to the south, burrows were smaller, usually about two inches in diameter. At Altotonga and Jalacingo, burrows were in hard, red earth. Mounds of this species are usually rather small, containing about one cubic foot of earth. Near Las Vigas, the mounds averaged bigger. Burrows were usually difficult to find, for they were usually about one foot beneath the surface and were solidly plugged near the mound.

Near Las Vigas, we found these gophers feeding extensively on the roots and lower stalks of corn. Sections of roots three to four inches long and a half inch in diameter were found strewn along their burrows. Near Altotonga they were also feeding on the roots of corn. We did not discover any food plants in burrows near Pescados, on the Cofre de Perote. Probably this gopher had been a serious pest to the cornfields for centuries before the discovery of the new world by Europeans.

The gopher is a serious pest throughout the state of Veracruz, and probably does more damage than any other single kind of animal. There is no adequate means of control available to the people owning small areas of land; they depend on the crops from their land for food for themselves and their families. Traps, poison, and gas are rarely available, are expensive, and are not very effective. When the depredations of the gophers become serious enough, men stand motionless, sometimes for hours, before an open gopher burrow, ready to impale the animal on a machete.

Seemingly this species of gopher does not breed in winter. We found no embryos in animals taken in November, and trapped no very young animals in the winter months.

Gophers are destroyed by man, and probably also by other animals. Near Las Vigas, we lost one gopher that was destroyed in the trap by a gray fox. This species of gopher is characteristically parasitized by a species of small, yellowish louse. From 30 to 50 lice were estimated to occur on most individuals. Fleas also occur on this gopher, but are rare.

Two of the three recognized subspecies of this species occur in Veracruz, *C. p. perotensis* and *C. p. estor*. "*C. p. peraltus* was described from Mount Orizaba 'Veracruz,' but the specimens actually came from Puebla, as shown [by] the labels and the collector's field catalogue" (W. W. Dalquest, MS.).

Among our specimens, those that are geographically referable to *C. p. perotensis* are, as a group, darker than *C. p. estor*, and more often have a sagittal crest. When the crest is present it is more fully developed anteriorly than in the specimens geographically referable to *C. p. estor*. Neither of these two characteristics, however, can be considered diagnostic either alone or in combination.

#### *Cratogeomys perotensis estor* Merriam

*Specimens examined*.—Total 27: 7 km. SE Jalacingo, 8000 ft., 1; 6 km. SSE Altotonga, 9000 ft., 2; 2 km. S Sierra de Agua, 8500 ft., 1; 2 km. W Las Vigas, 8000 ft., 1; Las Vigas, 8500 ft., 17; 2 km. E Las Vigas 8000 ft., 1; 3 km. E Las Vigas, 8000 ft., 4.

Additional records.—Las Vigas, 8000 ft., type locality (Merriam, 1895:155); 5 km. E Las Vigas, 8000 ft. (Davis, 1944:388).

#### *Cratogeomys perotensis perotensis* Merriam

*Specimens examined*.—Five from 1 km. NW Pescados, 10,500 ft., 5.

Additional records.—N slope Cofre de Perote, 10,500 ft. (Davis, 1944:387); Cofre de Perote, 9500 ft., type locality (Merriam, 1895:154).

#### *Cratogeomys fulvescens subluteus* Nelson and Goldman

##### Fulvous Pocket Gopher

*Specimens examined*.—Total 17: 2 km. N Perote, 8000 ft., 2; 2 km. E Perote, 8300 ft., 10; 3 km. W Limón, 7500 ft., 3; 2 km. W Limón, 7500 ft., 2.

Additional records.—Perote, type locality, 7800 ft. (Nelson and Goldman, 1934:152); Guadalupe Victoria, 8300 ft. (Davis, 1944:388).

The fulvous pocket gopher, like its neighbors, is termed "tuza" or "tuza de tierra," in Veracruz, and is abundant on the sandy Perote Desert, north of the Cofre de Perote. Their fresh mounds dotted the flats and, with the mounds of the kangaroo rats and ground squirrels, were observed along the highway through the Perote Desert from Sierra de Agua to the Puebla boundary, a distance of some 40 kilometers.

The fulvous pocket gopher seems to be diurnal as well as nocturnal. We took specimens in the daytime as well as at night. We had some difficulty in setting traps for this species because the soft, loose sand in which the burrows were constructed caved in at the slightest careless move. Mounds were large; well over a cubic foot of sand was included in each of most of them. The burrows were usually about three inches in diameter, and most of them were less than a foot under the ground. They were plugged near the mound.

Little was learned of the food habits of this species. In some places we found the gophers living in numbers where there seemed to be little food—only scattered grasses, weeds and cactus. In two places we found these gophers doing considerable damage to corn-fields. In one field we estimated that one-fifth of the crop had been taken by gophers. The corn raised on the Perote Desert is small and poor. In several places, beans were destroyed by the mounds of gophers. Wheat also is destroyed, by mounds which cover the shoots when the plants are small, and is eaten by the gophers as well. In some places we found where the gophers were feeding on the maguey plants, a cultivated crop. As these gophers are numerous and large, they are a serious pest where cultivation is carried on, and cultivation is extensive in the desert areas they occupy.

The series of specimens trapped in November consists principally of males. None of the females taken was pregnant. This species, like the Perote gopher, probably does not breed in winter.

Of the specimens taken, 13 were examined for parasites. Only one had lice, and that one only a few. In contrast, all of the *perotensis* examined had numerous lice.

#### Family Heteromyidae

#### *Perognathus flavus mexicanus* Merriam

#### Silky Pocket Mouse

*Specimens examined.*—Total 2: 2 km. W Perote, 8000 ft., 1; 3 km. W Limón [= San Antonio Limón], 7800 ft., 1.

On October 10, 1947, three kilometers west of Limón, a female of this tiny mouse was trapped on an almost white sand dune. She was not pregnant or lactating. There were scattered clumps of bunchgrass about and prickly pear (yellow fruit). Cholla, and tree yuccas were not far away. Another female taken in sand along a row of maguey plants two kilometers west of Perote on September 28, 1948, was lactating. No ectoparasites were found on these two mice.

**Dipodomys phillipsii perotensis Merriam**

## Phillips' Kangaroo Rat

*Specimens examined.*—Total 16: 2 km. N Perote, 8000 ft., 1; 2 km. W Perote, 8000 ft., 1; 2 km. E Perote, 8300 ft., 7; 3 km. W Limón, 7500 ft., 3; 2 km. W Limón, 7500 ft., 4.

*Additional records.*—Perote, type locality (Merriam, 1894:111); Guadalupe Victoria (Davis, 1944:391).

In Spanish, the kangaroo rat of the Perote Desert is called "ratón de cola grande." We failed to record the local Indian name. This species was found only on the open, sandy desert, where there were some shrubs, weeds, cactus and maguey plants. Grasses were scattered and sparse. Much of the desert is planted in corn, beans and wheat. In the same areas where we took kangaroo rats, we found the fulvous pocket gopher (*Cratogeomys fulvescens*) and the deer mouse (*Peromyscus maniculatus*) to be abundant.

The kangaroo rat is almost entirely nocturnal. We saw one dash across the road on a bright afternoon, but this individual had probably been frightened from its burrow by a snake or other predator. The rats were difficult to obtain, although present in numbers. They refused most trap-baits, including rolled oats, banana, walnuts, peanuts and peanut butter. We laboriously thrashed out the seeds of some native weeds, and so trapped two or three specimens. Most of our series, however, was taken by concealing traps at the entrances of their burrows or by shooting the animals at night, when their eyes reflected a dull red glow in the beam of a hunting light.

In 1947 we noted that burrows of this species were not plugged. They were about three inches in diameter at the mouth. There were two to five separate entrances a few feet apart. The tunnels from these entrances joined within a meter, where the burrow was about two inches in diameter. Scratchings were seen in the sand, but few tail marks were noted. A burrow excavated in September, 1948, was a foot below the surface. The main entrance was marked by a small mound of fresh sand. The main burrow was a slightly curved tube, four feet in length, and ending in a swollen chamber. There was no nest. About midway in the burrow several leaves of a kind of dandelion were within a few inches of each other. Approximately two feet from the end of the main burrow it branched, one part consisting of a two-foot long tube terminally vertical that opened on the surface where there was no pile of sand. The kangaroo rat escaped through this entrance when we opened its burrow.

Our specimens were taken from the last week of September to mid-November. No female taken at that time was pregnant. Several males were noted as having enlarged testes. Several of the rats taken were young. We suppose that litters are raised throughout spring and summer, probably regularly until August, and perhaps occasionally later. We found no ectoparasites on kangaroo rats in Veracruz.

### *Liomys pictus*

#### Painted Spiny Pocket Mouse

Where common this species sometimes is found in grassy fields, but seemingly is only a visitor there. It is more commonly found in brushland, under the dense, thorny scrub of palms and bullhorn acacia on the coastal plain, and in brushy, weed-grown borders of cornfields. The mouse prefers relatively open ground, littered with twigs and dry leaves—a habitat rarely occupied by mice in the United States. We took mice of this species by walking along the dry beds of arroyos and setting traps in the brush along the banks, where the brush was too dense to enter easily.

This species is common in the arid lower division of the Tropical Life-zone, and was occasionally taken in the humid lower division. On a few occasions it was taken in the humid upper division, but only at the very lowest edge of the zone, and where extensive sugar cane fields, or pastures extended into the plain, and presented a path of favorable habitat to the mice.

*Liomys pictus* is principally nocturnal. None was trapped in the daytime, but on the south bank of the Río Blanco, 20 kilometers west-northwest of Piedras Negras, on May 18, 1946, a boy hunting for lizards saw one of these mice run under a log. The time was about midday. He pulled away the log and killed the mouse by striking it with the switch of bamboo, used to kill lizards. The mouse was an adult female.

This species was rarely found in abundance. In suitable habitat from one to three specimens could be taken in a line of 100 mouse-traps each night. Often only one or two could be taken at a locality, in spite of much trapping. Three kilometers east of San Andrés Tuxtla the species was abundant and we took an average of about five specimens each day from a line of 60 traps. The traps were set along the borders of fields and under dense, low bushes on a hillside, and under low bushes beside a trail near a small lake.



Contents of the cheek pouches of captured animals consisted principally of seeds. On one occasion, two specimens had in their cheek pouches the seeds of seven or more species of plants. All of the seeds were from four to six millimeters in diameter. Seeds of about the size of a garden pea seemed to be preferred. Another mouse had been collecting small seeds, about the size of small peas, that were brilliant red on one side and jet black on the other. Soft, green leaves were often found in cheek pouches, and one animal was carrying the dry, branching joint of a dead weed in its pouch.

Breeding seems to occur throughout the year. The testes of males in breeding condition become greatly swollen, and the scrotum projects back under the tail. Some breeding records include:

Sept. 28—Breeding male;	Jan. 10—Four young mice;
Oct. 2—Young mouse;	March 2—Four embryos;
Oct. 3—Breeding male;	May 15—Breeding male;
Oct. 22—Nursing female;	May 18—Breeding male;
Jan. 8—Breeding males;	May 28—Breeding male;
Jan. 9—Breeding males;	May 29—Five embryos.

The only parasites noted on this species were small mites, pale brown or red above, and white below. These were about the size of a pinhead up to two millimeters in length. They were hard, and moved swiftly. Almost every spiny pocket mouse had a few of these mites, and some individuals had as many as 50.

### *Liomys pictus obscurus* Merriam

*Specimens examined.*—Total 44: Santa Maria, 4 (U. S. N. M.); San Carlos, 1 (U. S. N. M.); Carrizal, 1 (U. S. N. M.); Puente Nacional, 500 ft., 5; 4 km. W. Paso de San Juan, 250 ft., 3; Boca del Río, 10 ft., 4; 2 km. N Paraje Nuevo, 1700 ft., 1; Orizaba, 3 (U. S. N. M.); 15 km. ESE San Juan de la Punta, 400 ft., 2; Río Blanco, 20 km. WNW Piedras Negras, 8; Río Blanco, 20 km. W Piedras Negras, 400 ft., 2; 3 km. N Presidio, 1500 ft., 2; Otatitlán, 8 (U. S. N. M.)

Additional records.—Plan del Río (Davis, 1944:390); Pasa Nueva (Allen, J. A., 1904:31).

### *Liomys pictus veraecrucis* Merriam

*Specimens examined.*—Total 39: 3 km. E San Andrés Tuxtla, 1000 ft., 34; 5 mi. S Catemaco, 2; 14 km. SW Coatzacoalcos, 100 ft., 2; Jimba, 350 ft., 1.

Additional records.—Santiago Tuxtla (Goldman, 1911:43); Pasa Nueva (Allen and Chapman, 1904:31); San Andreas [= Andrés] Tuxtla (Merriam, 1902:47); Catemaco (Goldman, 1911:43).

### *Liomys irroratus*

#### Mexican Spiny Pocket Mouse

A single specimen of the subspecies *torridus* was captured four kilometers west of Acultzingo, 7500 feet elevation, on June 9, 1946, in a locality almost alpine in aspect, although above to the west, and

below to the east, the country was arid and desertlike. A low, dense stand of bushes was five feet high, and tall trees had the most luxurious growths of mosses, orchids and bromeliads seen in México.

Two specimens of the subspecies *alleni* were trapped 10 miles southwest of Jacales, 6500 feet elevation, on the "Chicontepec Rincón," of the Mexican Plateau. They were in low, thorny bushes on a dry hillside, among cactus plants and other desert flora.

Habitats for the subspecies *pretiosus* were listed as follows: "base of a wild orange tree on a hillside slope of 30°. Cover was dense grass and weeds about three feet high"; "dense cover of grass, weeds and succulent plants"; "open jungle of low trees and brush. Much of the ground was relatively open, with only dead leaves"; "in a cornfield"; "tall, dense grass and weeds"; "open, clear ground in a cornfield"; "a marshy place along a stream." This subspecies, in contrast to *alleni* and *torridus*, is tropical, inhabiting the lowlands. In the state of Veracruz at least, *alleni* and *torridus* are races of the highlands, where they live under almost desert conditions.

Mice of this species seem to be strictly nocturnal. Specimens were trapped only at night. Burrows noted in a cornfield near Gutierrez Zamora in November were open and about one inch in diameter. There were usually three to five within a square meter. One mouse trapped there had half its body still in its burrow. The soil was dark brown, crumbly, and claylike in texture. By setting traps only near burrows in cornfields we appreciably increased our catch of this species.

A mouse of this species seems to live 30 or more feet away from any other individual of its kind. The three to five holes mentioned above are almost certainly the work of a single mouse, for traps set near the groups of burrows (perhaps entrances to a single burrow) took only a single mouse each time.

In the aggregate these little mice must do considerable damage. They undoubtedly eat corn, though we have never found corn in their pouches. Seeds of native grasses and plants often were found in the cheek pouches of the mice. They seem to prefer seeds about the size of small peas.

We have few breeding records for this species. Some records for the subspecies *pretiosus* are as follows: Sept. 20—two females, each with 4 embryos; Oct. 16—male with enlarged testes; Nov. 7—male with enlarged testes; Nov. 8—two females, each with 3 embryos; Nov. 23—young mouse.

The common parasite on this species of mouse is a small, hard mite, described in our notes as "brown above and white beneath, rather slow-moving." One mouse had a large, white tick. Several individuals were taken that had lost parts of their tails.

### *Liomys irroratus alleni* (Coues)

*Specimens examined*.—Two from 10 km. SW Jacales, 6500 ft.

### *Liomys irroratus pretiosus* Goldman

*Specimens examined*.—Total 78: 5 mi. S Tampico, 4; Ozulama [= Ozulama], 500 ft., 3; La Mar, 20 ft., 1; Piedras Clavadas, 75 km. NW Tuxpan, 2; Plátón Sánchez, 8000 ft., 4; Ixcatepec, 70 km. NW Tuxpan, 3; 35 km. NW Tuxpan, 2; Potrero [del] Llano, 350 ft., 4; 25 km. NW Tuxpan, 2; 17 km. NW Tuxpan, 1; 15 km. NW Tuxpan, 1; 14 km. NW Tuxpan, 1; 6 km. N Tuxpan, 1; 5 km. NE Tuxpan, 1; 4 km. NE Tuxpan, 3; 12½ mi. N Tihuatlán, 300 ft., 8; 4 km. E Papantla, 400 ft., 1; 9 km. E Papantla, 300 ft., 6; 3 km. W Guttierrez [= Gutierrez] Zamora, 300 ft., 7; Miahuapa, 8 km. N Coyutla, 8 m., 6; Miahuapa (La Tulapilla), 15 km. NNE Coyutla, 80 m., 3; 1 km. ENE Coyutla, 120 m., 5; 3 km. SW San Marcos, 200 ft., 2; 4 km. W Tlapacoyan, 1700 ft., 7.

Additional records.—Nautla "near sea level" (Hooper and Handley, 1948: 20); near El Tajín Ingles (1959:394).

### *Liomys irroratus torridus* Merriam

*Specimen examined*.—One from 4 km. W Acultzingo, 7500 ft.

Additional record.—Acultzingo, 7000 ft. (Hooper and Handley, 1948:13).

### *Heteromys lepturus* Merriam

#### Santo Domingo Spiny Pocket Mouse

*Specimens examined*.—Total 14: Achotal, 11 (Chicago N. H. Mus.); 25 km. SE Jesús Carranza, 250 ft., 3.

Additional record.—San Andrés Tuxtla (Goldman, 1911:26).

On March 29, 1949, at our camp 25 kilometers southeast of Jesús Carranza an adult female spiny mouse got into the mosquito net of one of the native hunters, who was sleeping on the ground. In his attempt to capture the animal, the man accidentally lifted the edge of the net and the mouse escaped. An hour later it, or another individual, was back, and inside the mosquito net of another man. This time the mouse was captured. The same night a young male was taken in a trap, baited with peanut and set on open ground in the deep jungle. Two nights later a spiny mouse was shot as it was hunting for food on the open, leaf-littered ground beneath the tall trees in the dense jungle. The spiny pocket mouse is at its northern limit of distribution in the state of Veracruz, and is rare at the few places where it has been found.

We suppose that study of adequate material will show that *Heteromys lepturus* intergrades with *H. temporalis* and with *H.*

*desmarestianus*, in which case *lepturus* and *temporalis* will be arranged as subspecies of *H. desmarestianus*.

### *Heteromys temporalis* Goldman

#### Motzorongo Spiny Pocket Mouse

*Specimens examined*.—Three from 2 km. N Motzorongo, 500 ft.

*Additional record*.—Motzorongo, the type locality (Goldman, 1911:27).

Our three specimens were obtained on December 6, 8, and 9, 1946. The first was taken in the dense grass and weeds of an overgrown cornfield bordered on three sides by extensive fields of sugar cane and on the other by dense jungle. The only other mammal taken in the milpa on that date was a rice rat (*Oryzomys palustris*). Further trapping yielded no other *Heteromys*, in this milpa, although other small mammals were taken. The second specimen was trapped under coffee bushes where the ground was free of grasses and weeds. None of 40 other traps had been disturbed. Fifty traps set near this place in the abundant understory vegetation of a dense, poorly tended grove of coffee bushes, yielded the third *Heteromys*. The cheek pouches of one of these mice contained two coffee berries, 29 small round berries six millimeters in diameter, and a brown husk. The testes of one male measured 20 by 11 millimeters; the animal was probably in breeding condition. No parasites were found on any of the three specimens.

#### Family Cricetidae

#### *Oryzomys palustris*

#### Marsh Rice Rat

For use of the specific name *palustris* instead of *couesi* see Hall (1960:171).

This species prefers damp, marshy habitat, but occurs elsewhere, if there is sufficient cover. On the arid coastal plain we trapped a few of the rats beneath dense, dry, thorny bushes. Where the forest of the upper humid division of the Tropical Life-zone is dense, but open enough to support grasses, brush and annuals, rice rats are often abundant.

This species is principally, though not entirely, nocturnal. Of about 150 specimens trapped, only about five were taken in the daytime. All those taken in the daytime were young males.

At times marsh rice rats become relatively abundant. Catches of one rat to each three traps are not uncommon, but the specimens taken in these periods of abundance are almost all young, half-grown animals. Usually rice rats are less common; ordinarily about

one specimen is taken in 50 traps. These rats usually do not leave distinct runways in dense vegetation. Often the species is trapped in runways of other small mammals, such as *Sigmodon*. The marsh rice rat eats principally vegetation; nothing else was in stomachs of specimens trapped. One old female was taken in a steel trap baited with fish, and there was evidence that she had eaten some of the fish before becoming caught.

Breeding probably continues throughout the year. Young rats are taken at all times of the year, and always outnumber adults by about 10 to one. Some breeding records are as follows:

March 6—3 embryos;	Oct. 15—breeding male;
March 19—4 embryos;	Oct. 21—breeding male;
Sept. 12—7 embryos;	Oct. 26—3 embryos;
Sept. 19—5 embryos;	Dec. 6—breeding male;
Oct. 11—4 embryos;	Dec. 9.—breeding male.

Parasites were uncommon on marsh rice rats, but the following were recorded: two small brown mites in ear; one flea; six to eight small brown mites; three medium-sized ticks; two small ticks; a small tick, brown above, white below, that moved rapidly; a translucent bot fly larva under the skin of the abdomen, measuring 10 by 4 by 3 millimeters.

### *Oryzomys palustris couesi* (Alston)

*Specimens examined*.—Total 94: 5 km. N Jalapa, 4500 ft., 8; 7 km. NNW Cerro Gordo, 1500 ft., 4; 2 km. W Jico, 4200 ft., 1; Teocelo, 4500 ft., 7; 3 km. W Plan del Río, 1000 ft., 1; Mirador, 3500 ft., 3; Boca del Río, 10 ft., 1; Coscomatepec [= Coscomatepec], 5000 ft., 5; 5 km. SW Boca del Río, 1; Monte Blanco, 1300 m., 1; Río Atoyac, 8 km. NW Potrero, 13; 4 km. WNW Fortín, 3200 ft., 2; 1 km. W Mecayucan, 200 ft., 2; Potrero Viejo, 7 km. W Potrero, 1; Potrero Viejo, 1700 ft., 4; Cautlapan, 4000 ft., 2; 3 km. SE Orizaba, 5500 ft., 1; 7 km. SE San Juan de la Punta, 400 ft., 1; 15 km. W Piedras Negras, 300 ft., 1; 3 km. N Presidio, 1500 ft., 4; 2 km. N Motzorongo, 1500 ft., 6; 3 km. E San Andrés Tuxtla, 1000 ft., 4; Coatzacoalcos, 3; 14 km. SW Coatzacoalcos, 100 ft., 2; 35 km. ENE Jesús Carranza, 150 ft., 1; Jesús Carranza, 250 ft., 2; 20 km. E Jesús Carranza, 300 ft., 6; 25 km. ESE Jesús Carranza, 350 ft., 2; 30 km. ESE Jesús Carranza, 300 ft., 1; 55 km. ESE Jesús Carranza, 450 ft., 1; 35 km. SE Jesús Carranza, 400 ft., 2; 30 km. SSE Jesús Carranza, 300 ft., 1.

Additional records (Goldman, 1918:31).—Jalapa, 4400 ft.; Jico; San Carlos; Orizaba; Motzorongo; Tlacotalpam; Pasa Nueva; Catemaco; Achotal; Buena Vista; 75 mi. S Rivera; Ubero.

For use of the specific name *palustris* instead of *couesi* see Hall (1960:171).

### *Oryzomys palustris peragrus* Merriam

*Specimens examined*.—Total 64: 5 mi. S Tampico, 1; Hacienda Tamiahua, Cabo Rojo, 10; 1 mi. E Higo, 500 ft., 1; Platón Sánchez, 800 ft., 3; Cerro Azul, 350 ft., 1; Potrero [del] Llano, 350 ft., 4; 35 km. NW Tuxpan, 1000 ft., 2; 17 km. NW Tuxpan, 2; 5 km. NE Tuxpan, 1; 4 km. NE Tuxpan, 2; San Isidro, 100 ft., 2; 12½ mi. N Tihuatlán, 300 ft., 12; 5 km. S Tehuatlan [= Tihuatlán], 700 ft., 2; Miaupa (La Tulapilla), 15 km. NNE Coyutla, 80 m., 1; 3 km. SW San Marcos, 200 ft., 2; 4 km. W Tlapacoyan, 1700 ft., 18.



Additional record.—Papantla (Goldman, 1918:31).

For use of the specific name *palustris* in place of *couesi* see Hall (1960:171).

The specimens from Hda. Tamiahua differ some from the others from Veracruz, being ochraceous-reddish instead of ochraceous-yellowish. Their skulls resemble those of *O. p. aquaticus* (from Tamaulipas) more than they do those of *O. p. peragrus*. Both *aquaticus* and the specimens from Hda. Tamiahua have more widely spreading zygomata, and the ascending branches of the premaxillae tend to exceed the nasals posteriorly. The specimens from Hda. Tamiahua are slightly larger than those from the mainland between Tampico and Tuxpan. The specimens from Hda. Tamiahua are nevertheless referred to *peragrus* because of the resemblance of the two in size and in color.

One specimen, No. 24050, from 5 km. S Tihuatlan is larger than any other from Veracruz, including those from Hda. Tamiahua.

### *Oryzomys melanotis rostratus* Merriam

#### Black-eared Rice Rat

*Specimens examined*.—Total 34: Cerro Azul, 350 ft., 1; Tlacolula, 60 km. WNW Tuxpan, 1; Potrero [del] Llano, 350 ft., 1; 35 km. NW Tuxpan, 1000 ft., 5; 17 km. NW Tuxpan, 1; 5 km. NE Tuxpan, 1; 4 km. NE Tuxpan, 2; Tuxpan, 2; 3 km. SW San Marcos, 200 ft., 2; Mirador, 3500 ft., 2; Cautlapan, 4000 ft., 1; 3 km. N Presidio, 1500 ft., 5; 2 km. N Motzorongo, 1500 ft., 2; 3 km. E San Andrés Tuxtla, 1000 ft., 5; 20 km. E Jesús Carranza, 300 ft., 2; 35 km. SE Jesús Carranza, 400 ft., 1.

Additional records (Goldman, 1918:54).—San Carlos; Motzorongo; Pasa Nueva; Achotal.

At several localities we took one black-eared rice rat, and at other places two rats, but concentrated and continued trapping at these places seldom succeeded in capturing more. The species seems to be rather generalized as to its habits. Some data on habitat are as follows: Three kilometers north of Presidio specimens were trapped at the edge of a dense hillside jungle. An extensive sugar cane field extended up to the scattered limestone boulders at the foot of the hills. Our traps took *Oryzomys palustris* and *Sigmodon* in addition to *O. melanotis*. Two kilometers north of Motzorongo, two were trapped under weeds and coffee bushes on a hillside, along with *Oryzomys palustris* and *Heteromys*. Three kilometers southwest of San Marcos, a specimen was taken in deep jungle, along with *Peromyscus mexicanus*. At Mirador, two were trapped in an oak forest, where there was considerable thin, open underbrush and a few fallen logs. Three kilometers east of San Andrés Tuxtla, three were taken in deep jungle and another in dense bushes about three feet high. A few breeding notes are as follows: November 5, female with three small embryos; December 9, male with enlarged testes; December 12, one female with three embryos and another with four embryos. We recorded no parasites from this species.

## *Oryzomys alfaroi*

### Alfaro's Rice Rat

Alfaro's rice rat, or the blackish rice mouse as we called it in the field, inhabits dense vegetation, especially in damp places. Four kilometers west of Tlapacoyan and also 1 kilometer east of Jalacingo, the species was obtained in dense growth of low, succulent plants along small streams. Usually, in the uplands, this species is found with *Cryptotis mexicana*, *Microtus quasiater* and *Oryzomys palustris*. One individual was taken in a small, marshy swale. Near (two kilometers west) Jico, a small series was trapped in marshy places and in damp meadows of tall grass. At Mirador, specimens were trapped in succulent vegetation along the border of a tiny stream and in mossy, overgrown places in an oak forest at the edge of a coffee grove. At Teocelo, specimens were obtained in tall grass at the edge of a sugar cane field.

*Oryzomys alfaroi palatinus* is a lowland, jungle-inhabiting subspecies. We took it in small areas of tall grass, on the flood plains of rivers, and in deep jungle. In the jungle, the rice rats were found on bare, dry, leaf-littered ground. Two were shot on the floor of the jungle at night. They were heard rustling the leaves, probably hunting for food. Another was found under a log in the jungle. The log was beside a trail, on level ground. A growth of bushes and vines made a dense wall along each side of the log for half of its length. About six feet of the other half was slightly elevated above the ground, and there was no dense growth of vegetation along that part of the log. When the log was rolled to one side, a nest was revealed. It consisted of a loose ball of soft, brown vegetation, probably shredded bark, about five inches in diameter and three inches high, and was situated where the elevated part of the log came into contact with the ground. The nest was open on top, the log having formed the roof. The half-grown, male Alfaro's rice rat obtained from under the log was presumed to have used the nest.

Few parasites were recorded from *Oryzomys alfaroi*. One had a medium-sized tick. Each of two specimens taken on April 8 had four embryos.

### *Oryzomys alfaroi chapmani* Thomas

*Specimens examined*.—Total 37: 4 km. W Tlapacoyan, 1700 ft., 3; 1 km. E Jalacingo, 6500 ft., 6; 5 km. N Jalapa, 4500 ft., 1; 2 km. W Jico, 4200 ft., 13; Teocelo, 4500 ft., 6; Mirador, 3500 ft., 3; Huatusco, 5000 ft., 3; Coscomatepec [= Coscomatepec], 5000 ft., 2.

Additional records (Goldman, 1918:68).—Jalapa; Jico; Mirador.

On geographic grounds the specimens from the summit and northern side of the barrier range (1 km. E Jalacingo, and 4 km. W Tlapacoyan) would be expected to resemble *O. a. dilutior* but instead, in small and lightly-constructed skull, resemble *O. a. chapmani*.

### *Oryzomys alfaroi palatinus* Merriam

*Specimens examined*.—Total 13: 20 km. ENE Jesús Carranza, 200 ft., 1; 22 km. ESE Jesús Carranza, 300 ft., 1; 25 km. ESE Jesús Carranza, 350 ft., 4; 25 km. SE Jesús Carranza, 250 ft., 4; 63 km. ESE Jesús Carranza, 500 ft., 1; 35 km. SE Jesús Carranza, 400 ft., 1; 35 km. SE Jesús Carranza, 350 ft., 1.

Our specimens from the jungles of southern Veracruz are indistinguishable from the holotype of *O. a. palatinus*.

### *Oryzomys fulvescens fulvescens* (Saussure)

#### Pygmy Rice Rat

*Specimens examined*.—Total 54: Ozulama [= Ozuluama], 500 ft., 1; Platón Sánchez, 800 ft., 3; Tlacolula, 60 km. WNW Tuxpan, 1; Cerro Azul, 350 ft., 1; 1½ mi. N Tihuatlán, 300 ft., 2; 5 km. S Tehuatlan [= Tihuatlán], 700 ft., 1; 4 km. W Tlapacoyan, 1700 ft., 1; 5 km. N Jalapa, 4500 ft., 1; Jalapa, 1 (Chicago N. H. Mus.); 2 km. W Jico, 4200 ft., 1; Jico, 1 (Chicago N. H. Mus.); Teocelo, 4500 ft., 4; Teocelo, 4000 ft., 2; Mirador, 3500 ft., 1; 15 km. ENE Tlacotepec, 1500 ft., 1; 4 km. W Paso de San Juan, 250 ft., 1; 3 km. W Boca del Río, 10 ft., 2; Boca del Río, 10 ft., 1; 3 km. SW Boca del Río, 10 ft., 1; Coscomatepec [= Coscomatepec], 5000 ft., 2; Potrero Viejo, 1700 ft., 9; 3 km. SE Orizaba, 5500 ft., 2; Monte Blanco, 1300 m., 1; Cautlapan, 4000 ft., 3; 2 km. N Motzorongo, 1500 ft., 1; 3 km. E San Andrés Tuxtla, 1000 ft., 3; Achotal, 4 (Chicago N. H. Mus.); 20 km. E Jesús Carranza, 300 ft., 2; 25 km. ESE Jesús Carranza, 200 ft., 1.

Additional records (Goldman, 1918:91).—Mirador; Orizaba; Santiago Tuxtla; Pasa Nueva.

Specimens from northern Veracruz are smaller than specimens from central Veracruz, but are about equal in size to specimens from the southern parts of the state. We are not able to separate into subspecies Veracruzian specimens of this species on the basis of size or cranial characters, and specimens from the entire state are referred to the subspecies *O. f. fulvescens*.

The pygmy rice rat, termed pygmy rice mouse by us in the field, prefers a drier habitat than other members of its genus in Veracruz. It closely resembles the harvest mice (genus *Reithrodontomys*) in habits, as it does in appearance, and is usually taken in the trap lines that yield harvest mice. In the field, pygmy rice rats can be distinguished from *Reithrodontomys* by the plain, rather than grooved, anterior surfaces of the upper incisors.

We found the pygmy rice rat in dense vegetation, such as tall grass, brush, weeds, sugar cane, weedy stands of corn, meadows of sawgrass, patches of succulent plants, and thickets of tree fern. No distinct runways were identified with this species, but in its usual habitat, the cotton rat, *Sigmodon*, is common, and the pygmy rice rat, as well as harvest mice, *Reithrodontomys*, and pygmy mice, *Baiomys*, were commonly trapped in the runways of cotton rats.

Like other species of the genus *Oryzomys*, the young of this species are far more common than adults, although the disparity in numbers of the two ages was less than in *Oryzomys palustris*. Some breeding records for the pygmy rat are: November 15, three embryos; December 5, four embryos; December 17, four embryos; January 9, four embryos.

Parasites are usually present on this species. Some recorded are as follows: black larve of a large bot fly, under the skin of the abdomen, the larva being 14 mm. long, eight mm. wide, six mm. high, and having seven deep ridges or rings; two small ticks; mites.

### *Tylomys gymnurus* Villa

#### Naked-tailed Climbing Rat

*Specimens examined*.—Total 6: Río Atoyac, 8 km. NW Potrero, 1; 3 km. N Presidio, 1500 ft., 1; 2 km. N Motzorongo, 1500 ft., 1; 3 km. E San Andrés Tuxtla, 1000 ft., 2; 25 km. SE Jesús Carranza, 250 ft., 1.

*Additional record*.—Presidio (Villa, 1941:763).

All of our specimens from Veracruz here are referred to *T. gymnurus*, the type locality of which is Presidio. This is done in spite of the fact that the two specimens from 3 km. E San Andrés Tuxtla differ considerably from material from Presidio and vicinity. Two other nominal species of *Tylomys* have been named by Merriam (1901). They are *T. tumbalensis* from Tumbala, Chiapas, and *T. bullaris* from Tuxtla Gutierrez, Chiapas, based on specimens so young as to permit little if any more than generic identification. Each of the two is known only from the holotype. When adults of *tumbalensis* and *bullaris* are obtained, the single specimen from 25 km. SE Jesús Carranza probably will prove to be referable to *tumbalensis* or *bullaris*, and the specimens from 3 km. E San Andrés Tuxtla may be found to represent an unnamed kind. We suppose that all of the kinds mentioned above are subspecies of a single species, but specimens have yet to be collected that will permit an objective decision.

Climbing rats of the genus *Tylomys* seem to be uncommon in Veracruz. They are difficult to trap, usually refusing to take bait of any kind. We found them only in the tall, dense forests, and in most cases, near rocks and cliffs. Several were seen in caves, and in a number of other caves piles of the droppings of a large rat, almost certainly of the climbing rat, were seen.

Since almost nothing has been recorded of the habits of this rat, the following notes taken at the time of capture of specimens are included:

At the Río Atoyac, eight kilometers northwest of Potrero, 1500 feet elevation, on March 12, 1946, I set a line of steel traps on the hillside in extremely dense, junglelike forest. Vines and creepers were so dense that it was almost impossible to penetrate the area without a machete. Quail doves were common here, and on a



previous day I had shot an owl here in the daytime. A band of *Nasua* was seen and the traps were set for this animal. On the following morning a large rat was found in a trap set in a narrow pass between two limestone boulders. Under the overhang of one of the boulders each one of about a double handful of dry coffee berries had a large hole eaten in one side. Only a few rat droppings were noted in the vicinity. The specimen was a female containing two large embryos.

Three kilometers north of Presidio, on December 3, 1946, "at the type locality of this rat, we took a specimen after four days of trapping for it. Traps were set in dense jungle on the hillside. They were baited with prunes, raisins, and rolled oats without success. On the fourth day we tried our old standby—banana, though it is rather soft for rat trap bait. It was successful, however. Traps were set in trails, under and on limestone boulders, on root masses, and tied in trees. The rat was taken in a trap set on a ledge, about four inches wide, on a limestone outcrop or cliff about 10 feet high and 50 feet long. The entire area where the traps were set is densely grown with vegetation. Trees are tall, about 100 feet. The crowns of the trees are grown into great masses of vines and creepers, with much parasitic and epiphytic growth—orchids, bromeliads, ferns and mosses. Lower is dense brush, some coffee but mainly other plants. This reaches an average height of seven feet and it too is laced with vines. The ground is rather dark and free of grasses, etc.

"The rat is a male. Unfortunately the skull was broken by the trap. The tail is very hard-looking. The black portion has an enameled look, almost polished. The white is ivory-color except near the tip, where it is flesh tinted. No ectoparasites were found. The stomach contained finely-chewed, olive-green, odorless vegetation. The testes were large (20 by 11 mm.) and probably in breeding condition."

Two kilometers north of Motzorongo on December 11, 1946, I wrote that we had not found sign of this rat among the limestone boulders in the jungle that I considered typical habitat for the rat and had not caught even one rat in rat traps set there for several days. "Last night I set ten rat traps, tied to branches and vines, in low, dense trees along the arroyo here, and baited them with bananas in hope of catching a fruit bat. The area is fully 100 meters from limestone, though the jungle is all about. This morning one trap held a *Tylomys*. The trap was over the water of a pool, in dense vines and branches, about 15 feet from the water. Some-



thing had eaten the head completely off, but I saved the body skin. It is a small male with testes only ten by five millimeters."

Three kilometers east of San Andrés Tuxtla on January 10, 1948. "Last night a large rat was seen in the jungle. I am almost sure it was this species. It ran across a horizontal vine about three inches in diameter and vanished in the branches of a tree. It moved jerkily, almost like a *Peromyscus*, but almost unbelievably fast. I could not get a shot at it.

"This afternoon we set six traps baited with walnuts, in the trees and vines where the rat was seen."

In the next three days the traps were visited every morning, and again in the evening, and various baits were tried. Climbing the trees was difficult, and was made unpleasant by the swarms of ants that viciously bit every exposed part of the body. Bananas and walnuts failed to take the rat, but on January 11, it, a fine adult female, was caught in a trap baited with a prune. Immediately anterior to the vagina a penislike structure was 20 mm. long, four wide, and three thick, a flattened structure without ossification. The mammae were all abdominal, close to the anus and vagina. The female contained two large embryos. The animal was not fat and no ectoparasites were noted on it.

Its stomach was full, not of fruit as I had expected, but of finely-chewed, brownish green, fibrous vegetation. It looked like lichen, had a rank odor, and may have been bark.

At the same locality on January 14 about one hour after dark, I saw a tree rat about 60 feet from the ground in a capulin tree in the jungle. I was able to recognize it as a *Tylomys* by the large amount of white, its long body, and small, bright red eyes. It ran along a horizontal branch about four inches in diameter to an old squirrel's nest. As I lost one rat by waiting for it to stop, I shot this one as it ran. It stuck in the tree. Next morning the rat still was in the tree. After we tried several means of dislodging it, and failed, we had to cut down the tree. This took all morning, working by turns with machetes. The rat was a fine large male with large testes.

Although he was in a capulin tree with ripe fruit, where birds and squirrels fed by day and marsupials by night, the rat had no fruit in its stomach, but only the yellowish and dark green pasty mass. No ectoparasites were noted, but the rat had been dead in the tree for 16 hours before we handled it.

A small male, seemingly in adult pelage, was obtained 25 kilometers southeast of Jesús Carranza, in extreme southern Veracruz,

on August 31, 1949. He was caught in a live trap, baited with banana, tied in a tree about 10 feet from the ground.

*Nyctomys sumichrasti sumichrasti* (Saussure)

Sumichrast's Vesper Rat

*Specimens examined.*—Total 14: Coscomatepec, 5000 ft., 1; 20 km. E Jesús Carranza, 300 ft., 1; 25 km. SE Jesús Carranza, 250 ft., 9; 35 km. SE Jesús Carranza, 350 ft., 1; 38 km. SE Jesús Carranza, 500 ft., 2.

*Additional records.*—Eastern slope of the mountains in Veracruz (Saussure, 1860:107); Uvero (Sumichrast, 1882:325); Jalapa (Allen and Chapman, 1897:204).

The type locality of the subspecies *N. s. sumichrasti* was recorded in the original description as the eastern slope of mountains in Veracruz. Sumichrast's (1882:325) account suggests that Uvero is the type locality. Our only record of *Nyctomys* from the eastern slope of the principal mountain range is a tail, taken in a mouse trap at Coscomatepec, 5000 feet elevation. It is unlikely that our specimens from near sea level in southern Veracruz are of the same subspecies as that living in the upland forest of central Veracruz, but in the absence of specimens from the latter area we use the name *N. s. sumichrasti* for all of our specimens.

The tail referred to above was in a trap set beside a tiny stream, under low, dense, woody plants and low, twisted trees.

In southern Veracruz, the vesper rat is common but difficult to catch. Twenty kilometers east of Jesús Carranza, an adult female was shot at night in a palm jungle. She was on the branch of a bush, about five or six feet from the ground, and ran along a horizontal vine and palm frond. Traps set in the area took no additional specimens. Traps tied in trees and bushes 38 kilometers southeast of Jesús Carranza took the tail of one specimen and two young animals.

At places 25 and 35 kilometers southeast of Jesús Carranza, in the last week of March and the first weeks of April, 1949, we hunted vesper rats in hollow trees in the jungle. We took our first specimen while hunting for the two-toed anteater (*Cyclopes*). A fire was built in the hollow of a tree. The rat ran from a small opening in the trunk about 10 feet from the ground. Several young were clinging to its teats. We found that by investigating every hole in every forest tree, especially holes from one to three inches in diameter, leading to relatively small hollows, nests of this species could be found in fair numbers. The hollows were probed with sticks, or, if the hollow was sinuous, with sections of flexible vine. When necessary, fires were built and the hollows were smothered in smoke. The rats were forced to flee and often emerged from the hollows and climbed the tree trunk or attempted to escape by running along

horizontal limbs. They ran at fair speed, not so slowly as the red tree mouse (*Phenacomys longicaudus*) of California, but more slowly than one would expect. Five specimens, all adult females with small young clinging to their teats, were shot while attempting to escape.

The nests of *Nyctomys*, as we found them, and including only brood nests as far as we know, were irregular masses of shredded bark that formed platforms at the bottoms of, or across, hollows in trees. The hollows varied from six to 13 inches in diameter. The nests were often superimposed on other, older nests. One hollow contained five nests, one on top of another. Only the upper nest was new and in use. Each of the nests contained a central cavity in the form of a flattened sphere, or oval, about four inches in diameter and three inches high. The nests, especially the old nests, were the homes of many insects, spiders and scorpions, and a lizard was in one. In spite of this we found no ectoparasites on any of the specimens examined.

***Reithrodontomys megalotis saturatus* J. A. Allen and Chapman**  
**Western Harvest Mouse**

*Specimens examined*.—Total 54: 2 km. N Los Jacales, 7500 ft., 1; 4 km. S Jalacingo, 1; 1 km. W Las Vigas, 8500 ft., 14; Las Vigas, 8500 ft., 22; 3 km. E Las Vigas, 8000 ft., 2; 1 km. NW Pescados, 10,500 ft., 4; 3 km. W Limón, 7500 ft., 4; 3 km. W Limón, 7800 ft., 2; 2 km. W Limón, 7500 ft., 3; 3 km. W Aculzingo, 7000 ft., 1.

*Additional records* (Hooper, 1952:60).—Jalacingo, 5500-6000 ft.; near Alto-tonca [= Altotonga], 6000 ft.; vicinity of Las Vigas, 7500-8000 ft.; Perote, 8000 ft.; Guadalupe Victoria, 8300 ft.; N slope Cofre de Perote, 10,000-10,200 ft.; Cofre de Perote; Volcán de Orizaba, timber line; Xuchil. (The specimens recorded by Howell, 1914, page 37, as from the State of Veracruz, at Huachinango and Mount Orizaba, seem actually to be from the State of Puebla.)

In Veracruz the western harvest mouse is confined to the higher western part of the state. It occurs in a number of habitats. Within a three-mile radius of Las Vigas we took specimens in a marshy place, along the bank of a tiny stream, in zacaton grass, in an old field overgrown with weeds, in brush along the border of a cornfield, and once in a pine forest. The same trap lines usually took *Cryptotis mexicanus* and *Microtus mexicanus*. On the Cofre de Perote, we took this mouse in meadows of tall zacaton grass, and two to three kilometers west of Limón on the desert we captured specimens among rocks, cactus, yuccas, and on the open, sand flats. The habitat range of the species is wide, but its altitudinal range is limited. In Veracruz we found it from 7000 to 10,500 feet.

At most places the western harvest mouse was uncommon, although in some habitats, for example in an old, weed-grown field

three kilometers east of Las Vigas, it was abundant. Generally speaking, it was more abundant than other species of harvest mice in Veracruz.

Most of our specimens were taken in winter, and we, therefore, have few breeding records. On October 4, a female had four embryos. On November 3, a female had recently given birth to young.

Several nests of this mouse were found within a three-mile radius of Las Vigas. Two were in a field under old boards so rotten that they crumbled when overturned. The nests were rounded, and set in small cavities in the ground. Outside diameters were five and five and one half inches. The central cavities were small, only about two inches in diameter. Other nests were found in low, stone walls, when the stones were moved in our search for snakes and other animals. Well-worn trails, runways and burrows formed a network among the stones, and several harvest mice were captured by hand when they tried to escape along these runways. The nests in the rock walls resembled those under the boards, but were more irregular in shape. No young mice were found in these nests.

### *Reithrodontomys chrysopsis perotensis* Merriam

#### Volcano Harvest Mouse

*Specimen examined*.—Cofre de Perote, 9500 ft., 1 (type in U. S. National Museum).

*Additional record* (Hooper, 1952:90).—N slope Cofre de Perote, Los Conejos, 10,600 ft.

### *Reithrodontomys sumichrasti sumichrasti* (Saussure)

#### Sumichrast's Harvest Mouse

*Specimens examined*.—Total 8: 1 km. E Jalacingo, 6500 ft., 1; Las Vigas, 8500 ft., 3; 5 km. N Jalapa, 4500 ft., 1; 3 km. W Acultzingo, 7000 ft., 1; 4 mi. SW Acultzingo, 7000 ft., 2.

*Additional records* (Hooper, 1952:74).—Jalacingo, 5500-6000 ft.; Altotonca [= Altotonga], 6000 ft.; vicinity of Jalapa, 4500 ft.; vicinity of Jico, between 4500 and 6500 ft.; Orizaba; Maltrata, 6000 ft.; vicinity of Acultzingo.

This species of harvest mouse seems to be rather rare. We took only a few specimens. Five kilometers north of Jalapa, on October 20, 1946, one was taken in a swamp supporting purple-flowered plants having stiff stalks about five feet high; fuzzy, tall, stiff grass, about four feet high; thorny trees; vines and other dense vegetation. Beneath the dense mat of roots, two feet or more deep, the soil was cold and damp. *Oryzomys alfaroi*, *Oryzomys palustris* and *Microtus quasiater* were taken in the same trap line.

Three kilometers west of Acultzingo, one specimen of *R. s. sumichrasti* was obtained in brush as were two specimens of *Peromyscus difficilis*. The bushes were high and dense. Numerous large clumps of ferns, mosses, bromeliads, and orchids grew there. A tall (eight foot) bush was in fruit, and provided abundant small, yellowish, applelike fruit.

### Reithrodontomys fulvescens

#### Fulvous Harvest Mouse

We took a specimen 10 kilometers southwest of Jacales and another six kilometers west-southwest of Zacualpilla in the dry desert of the Chicontepec Rincón amongst dry grass, maguey and cacti. In the upper humid division of the Tropical Life-zone, a few of our specimens were taken in sugar cane fields, but most were taken in the tangles of weeds and grasses along the borders of cornfields. Only at Teocelo, did we find the upland subspecies, *difficilis*, to be common.

The lowland subspecies, *tropicalis*, occupies dry, grassy areas, and is readily taken also in the weeds and grasses along the borders of fields. Generally, a few fulvous harvest mice are to be found in the extensive fields of sawgrass on the coastal plain.

Wherever we found the species in Veracruz, whether in arid desert, coastal plain or humid jungle, it was in weeds, grasses, vines, or other dense low-growing vegetation. Other rodents most commonly associated with this species were *Sigmodon hispidus*, *Oryzomys fulvescens* and *Baiomys*. Some breeding records for the subspecies *tropicalis* are:

Oct. 28—four embryos; also nursing female;	Nov. 14—nursing female;
Oct. 30—four embryos; also three embryos;	Nov. 27—two nursing females;
	Dec. 12—three embryos;
	Jan. 17—breeding male.

Parasites are not common on this species. Small mites were noted on some specimens and a tick was attached to the head of one mouse.

### Reithrodontomys fulvescens difficilis Merriam

*Specimens examined*.—Total 32: 3 km. W Zacualpan, 6000 ft., 1; 10 km. SW Jacales, 6500 ft., 1; 6 km. WSW Zacualpilla, 6500 ft., 1; Teocelo, 4500 ft., 24; 15 km. ENE Tlacotepec, 1500 ft., 2; Potrero Viejo, 1700 ft., 3.

Additional records (Hooper, 1952:111).—1½ mi. N Jalapa, 4500 ft.; 4 mi. SE Jalapa, 4800 ft.; Jico, 4300 ft.; Mirador, 3500 ft.; Orizaba, 4000-4200 ft.; Río Blanco, 4200 ft.

### Reithrodontomys fulvescens tropicalis Davis

*Specimens examined*.—Total 63: Chijal [= Chijol], 3; 19 mi. W Tampico, 7; 5 mi. S Tampico, 4; Tampico Alto, 50 ft., 2; 1 mi. E Higo, 500 ft., 1; Platón



Sánchez, 800 ft., 2; Potrero [del] Llano, 350 ft., 3; 35 km. NW Tuxpan, 1000 ft., 3; 15 km. NW Tuxpan, 6; 6 km. N Tuxpan, 1; 3 km. E Tuxpan, 1; San Isidro, 100 ft., 2; 12½ mi. N Tihuatlan, 300 ft., 3; 5 km. S Tehuatlan [=Tihuatlán], 700 ft., 1; 7 km. NNW Cerro Gordo, 20; Río Blanco, 20 km. WNW Piedras Negras, 3; 15 km. W Piedras Negras, 300 ft., 1.

Additional records (Hooper, 1952:109).—Nautla, 75 ft.; San Carlos, 25 ft.; vicinity of Plan del Río, 900-1000 ft.; Carrizal, 1000 ft.; Boca del Río, 10 ft.; Presidio, 1000 ft.; Catemaco, 1100 ft.

### *Reithrodontomys mexicanus mexicanus* (Saussure)

#### Mexican Harvest Mouse

*Specimens examined*.—Total 17: 35 km. NW Tuxpan, 1000 ft., 1; 4 km. W Tlapacoyan, 1700 ft., 5; 1 km. E Jalacingo, 6500 ft., 2; 2 km. W Jico, 4200 ft., 2; Teocelo, 4500 ft., 1; Coscomatepec [=Coscomatepec], 5000 ft., 3; Río Atoyac, 8 km. NW Potrero, 1; Cuautlapan, 1; 3 km. SE Orizaba, 5500 ft., 1.

Additional records.—Altotonca [=Altotonga], 6000 ft. (Hooper, 1952:144); Jalapa, 4000 ft. (Merriam, 1901:552); Córdoba, 3000 ft. (Hooper, 1952:144).

This is a rare species of harvest mouse. A few specimens were taken, as often as not only one at a place. In each of several localities where a specimen was obtained intensive trapping usually failed to bring additional individuals to light.

Along the Río Atoyac, eight kilometers northwest of Potrero, 1700 feet elevation, one of these mice was taken in a clearing that had been a banana grove. Numerous limestone boulders lay among the thistles and other herbaceous plants. Two kilometers west of Jico one was taken among scattered boulders in a coffee grove at the foot of a cliff, and another was taken, along with several individuals of *Oryzomys alfaroi*, in a line of 125 traps set at the edge of a cleared coffee grove in bushes alongside a stone fence and a cliff. Three kilometers southeast of Orizaba one was taken in brush and grasses at the rim of the gorge of the Río Blanco. At Teocelo one was trapped in the runway of a pine mouse (*Microtus quasiater*) through the lush, herbaceous vegetation at the edge of a tiny stream on a steep hillside.

On December 1, 1948, at Coscomatepec, we were removing large bromeliads from trees, in search of reptiles and amphibians, when the nest of a Mexican harvest mouse was found. It was a ball of grasses and root fibers, about nine inches in diameter, rather loosely constructed, in plain view about eight feet from the ground on top of a large bromeliad growing from the trunk of a thorny tree. There were no twigs or limbs below the nest and none for several feet above it. When first sighted, the nest was mistaken for an old nest, of a bird, that had fallen from the tree above. Not until the bromeliad had been removed from the tree, and the nest partially pulled apart, did we find it to be a fresh nest. The three large young mice in the nest were two males and one female. All

were captured and prepared. The young measured from 160 to 168 mm. in total length.

A female of this species, from eight kilometers northwest of Potrero, contained four small embryos on February 28, 1946.

The specimen (No. 83125) from 35 km. NW Tuxpan, 1000 ft., is *R. mexicanus*, but differs from other specimens of *R. mexicanus mexicanus* from Veracruz. The pelage is paler, lacks any of the darker color in the middle dorsal area, and the sides are more cinnamon. The skull is 0.8 mm. longer than the maximum re-

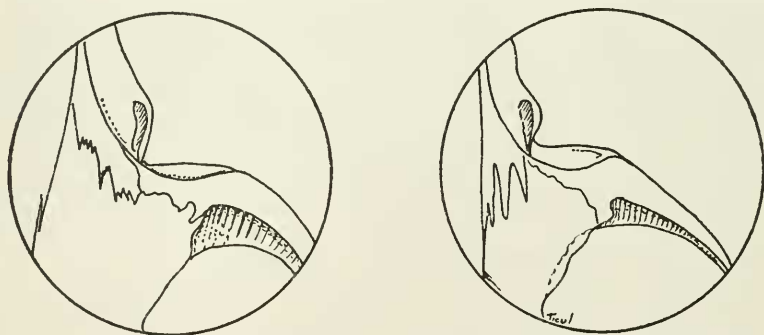


FIG. 2. Dorsal view of right root of zygomatic arch in two adult females of *Reithrodontomys mexicanus mexicanus* from Veracruz.  $\times 6$ .

Left. No. 83125, from 35 km. NW Tuxpan, 1000 ft.

Right. No. 19396, from 27 km. W Jico, 4200 ft.

Note difference in depth and shape of zygomatic notch, and difference in shape of maxillary root of zygoma.

corded by Hooper (1952), and from other specimens of *R. m. mexicanus* differs as follows: deeper; rostrum broader and longer; maxillary tooth-row shorter than the minimum; incisive foramina smaller; keel of zygomatic plate scarcely visible when the skull is viewed from directly above; zygomatic notch different in form as shown in figure 2.

### *Peromyscus maniculatus fulvus* Osgood

#### Deer Mouse

*Specimens examined*.—Total 184: 1 km. W Las Vigas, 8500 ft., 14; Las Vigas, 8500 ft., 11; 2 km. W Perote, 8000 ft., 55; 2 km. E Perote, 8300 ft., 56; 2 km. E Perote, 7000 ft., 8; 1 km. NW Pescados, 10,500 ft., 4; 3 km. W Limón, 7800 ft., 6; 3 km. W Limón, 7500 ft., 5; 2 km. W Limón, 7500 ft., 23; 4 mi. SW Acultzingo, 7000 ft., 2.

Additional records (Osgood, 1909:87, unless otherwise noted).—Perote, 1½ mi. S Perote, 8500 ft. (Hooper, 1957:5); Guadalupe Victoria (Davis, 1944:394); Cofre de Perote; Xuchil.

The deer mouse occupies open habitats at high elevations. We found it to be more abundant on the sandy soil of the desert north

of the Cofre de Perote than elsewhere. There, on the open desert flats, mice, principally of this species, were more abundant per unit of area than anywhere else in Veracruz where we collected. More than 50 deer mice were taken in 100 traps in each of several nights.

The deer mouse is nocturnal. Of the several hundred trapped, we caught only one in the daytime. It was young, in the gray coat, beneath a maguey plant. This species begins to appear on the surface of the ground shortly after dark sets in, but does not emerge in abundance until about one half hour after dark. From then until midnight, deer mice are extremely active, and on a dark, moonless night may be seen by the hundreds. After midnight they are less active. Traps that were examined at several different times in the night caught by far more mice between one half hour after dark and midnight than later.

The homes of these mice near Perote, in early November, 1946, were burrows in the soft sand. More individuals were seen and trapped near maguey plants than on open sand, but the mice were present on the open sand, free of any but the most sparse cover, in great numbers. Mice were seen to enter burrows on a number of occasions, when watched by the aid of a flashlight. Attempts to excavate these burrows, both at night and in the following day, failed, because the soft sand caved in and the burrows were lost in less than a meter. One kilometer northwest of Pescados the burrows of these mice were open holes, leading down vertically into the ground, in a rather dry meadow. Here the soil was too hard and too rocky to excavate for any considerable distance.

In their ordinary movements at night, these mice are rather slow and deliberate. They climb well, and many times were seen on the big leaves of the maguey plants, several feet from the ground. When startled, the mice made a series of erratic leaps, with many sidewise hops, and were difficult to catch with the hands. When captured, they bit viciously, and their long, sharp incisors were capable of inflicting painful wounds.

At Las Vigas, these mice were fairly common in the long rows, or "cercas," of maguey plants. Here they were found with the Mexican vole (*Microtus mexicanus*), harvest mice (*Reithrodontomys*) and shrews (*Cryptotis* and *Sorex*). On the Perote Desert deer mice were caught in the same line of traps that caught the kangaroo rat (*Dipodomys phillipsii*) and the Perote mouse (*Peromyscus bullatus*). These are all species found on the loose sand. We took no deer mice among rocks nearby; the rocks were occupied by the big-eared rock mouse, *Peromyscus difficilis*.

Deer mice eat principally weed seeds, and probably some soft plant material. They eat some meat; several small mammals were eaten in the traps near Perote, and the tracks on the loose sand showed that they were eaten by this species. On the Perote Desert, we found many deer mice parasitized by the warble of a large fly. These warbles were chestnut brown, had heavy transverse ridges, and were three-quarters of an inch long, one half inch wide, and one-quarter of an inch high. One large flea was noted. One mouse had a large swelling on the hind leg, and another had a large internal cyst. The remains of deer mice were found in the stomach of an opossum (*Didelphis*) from Perote.

Seemingly this species rarely breeds in winter. In November, 1946, northeast of Cofre de Perote (see list of specimens examined) only a few of the many mice trapped were young. Also, only one of more than 50 females examined was pregnant. She had three small embryos. At Las Vigas, in late October, 1948, only a few of the mice collected were young, and no pregnant females were taken.

### *Peromyscus melanotis* J. A. Allen and Chapman

#### Black-eared Mouse

*Specimens examined.*—Total 27: 10 km. SW Jacales, 6500 ft., 1; 6 km. SSE Altotonga, 9000 ft., 2; 1 km. W Las Vigas, 8500 ft., 10; Las Vigas, 8500 ft., 3; 2 km. E Las Vigas, 8000 ft., 1; 4 km. SE Las Vigas, 9500 ft., 1; 1 km. NW Pescados, 10,500 ft., 9.

Additional records (Osgood, 1909:112, unless otherwise noted).—Perote; 1½ mi. S Perote, 8500 ft. (Hooper, 1957:5); N slope Cofre de Perote (Davis, 1944:395); Cofre de Perote; Santa Barbara Camp, Mount Orizaba.

We found this species to be relatively rare in Veracruz. Four kilometers southeast of Las Vigas, in 1946, we took only one specimen in 100 traps set in a deep canyon under logs, rocks and clumps of zacaton grass. A small series of topotypes was taken in October, 1948, principally in brush and under logs on the borders of cornfields one kilometer west of Las Vigas. This mouse did not occur in the lava rocks, where *Peromyscus boylii* was common, nor did we take it along the rows of maguey plants where we found many individuals of *Peromyscus maniculatus*. A few black-eared mice were taken in brush along the border of a cornfield six kilometers south-southeast of Altotonga.

On the Cofre de Perote, one kilometer northwest of Pescados, we found these mice in November. They did not emerge from their holes until after dark, and were so active that we were unable to catch them by hand. Their holes were less than one inch in diameter and descended vertically into the ground. The ground had been

covered with a species of short grass, but this had been grazed by sheep and goats to one inch of the ground. We found 20 burrows in an area of an acre, and probably there were many others. Both *Peromyscus maniculatus* and *melanotis* were living in these burrows. Specimens were trapped in nearby zacaton grass, along with *Neotomodon alstoni*.

The black-eared mouse was breeding in November, one kilometer northwest of Pescados, when the ground was covered with frost almost every night. On November 4, the nest of a black-eared mouse was found 10 kilometers southwest of Jacales, at 6500 feet elevation, under a rock in an arid pine forest. The ground was covered with short, dry grass. Rocks were few. The rock under which the nest was found was about three feet long, two feet wide, and a foot thick. It was well embedded in the ground. The nest was at the end of a runway or burrow two feet long, that ran under the center of the rock, parallel with its long axis. The oval nest was open on top where an area of two and three-fourths square inches of it touched the rock. The nest itself was about three inches in length and two and one half inches in width and height, and formed of dry grass. The walls were only about one-half inch thick. The occupant, a male, was captured.

### *Peromyscus leucopus*

#### White-footed Mouse

The white-footed mouse in Veracruz inhabits principally brush, rarely enters deep forest, and where it does so usually occurs only along the edges of fields or brushland, or where there are numerous boulders. This species is often common in brush, fields and weeds, where the vegetation is dense, and is often trapped also in sugar cane fields, and in newly cleared areas where there are many fallen logs. On the coastal plain, this mouse seems to be rare, and only a few specimens were taken in tall grass. In northern Veracruz, most of our specimens were taken in the brush and weeds along the edges of fields and in cornfields.

At Potrero Llano we found several nests of the white-footed mouse in a 20-acre cornfield that had been cleared about two years previously. The larger tree trunks were left lying on the ground, although all smaller trunks and limbs had been cut away and burned. The bark of the large trees had become loosened from the trunks in many places and when we opened these bark "blisters" by means of our machetes, we found numerous lizards, a few snakes, and about a dozen mouse nests. Seemingly all of the nests were of this species



of mouse. The few mice captured in the nests were all *P. leucopus*. The nests were irregular masses of grass and inner bark of trees and varied from five to eight inches in diameter. They usually were flattened and fitted between the tree and the bark. The central cavities were large for such small mice, usually about four inches in diameter. No young mice were found in the nests.

Some breeding records for this species are as follows:

Sept. 26—Young mouse (gray coat);

Oct. 12—four embryos;

Oct. 25—male in breeding condition; four embryos; six embryos;

Dec. 2—six embryos;

Dec. 3—four embryos; male in breeding condition; two young mice.

### *Peromyscus leucopus affinis* (J. A. Allen)

Record.—Pasa Nueva (Hall and Kelson, 1959:628).

### *Peromyscus leucopus incensus* Goldman

*Specimens examined*.—Total 149: 19 mi. W Tampico, on Highway 110, 10; 16 mi. W Tampico, on Highway 110, 3; 5 mi. S Tampico, 5; 1 mi. E Higo, 500 ft., 3; El Cepillo, 20 ft., 2; S end Isla Juana Ramírez, Laguna Tamiahua, 3; Hacienda Tamiahua, Cabo Rojo, 19; La Mar, 20 ft., 3; Platón Sánchez, 800 ft., 8; Ixcatepec, 70 km. NW Tuxpan, 1; Tlacolula, 60 km. NW Tuxpan, 1; Cerro Azul, 350 ft., 1; 35 km. NW Tuxpan, 1000 ft., 8; Potrero [del] Llano, 500 ft., 48; 17 km. NW Tuxpan, 1; 15 km. NW Tuxpan, 2; 14 km. NW Tuxpan, 2; 6 km. N Tuxpan, 4; 4 km. NE Tuxpan, 2; Tuxpan, 3; 3 km. E Tuxpan, 1; 4 km. E Tuxpan, 3; 12½ km. N Tihuatlán, 300 ft., 8; 5 km. S Tehuatlan [= Tihuatlán], 700 ft., 1; 3 km. W Gutierrez [= Gutierrez] Zamora, 300 ft., 1; 3 km. W Boca del Río, 10 ft., 5; 5 km. SW Boca del Río, 1.

Additional records (Goldman, 1942:158).—Otatitlan; San Andrés Tuxtla.

### *Peromyscus leucopus mesomelas* Osgood

*Specimens examined*.—Total 65: 7 km. W El Brinco, 800 ft., 6; Miahuapa (La Tulapilla), 15 km. NNE Coyotla [probably = Coyutla], 80 m., 1; Miahuapa, 8 km. N Coyutla, 80 m., 1; 4 km. W Tlapacoyan, 1700 ft., 5; Teocelo, 4500 ft., 6; Mirador, 3500 ft., 4; Río Atoyac, 8 km. NW Potrero, 13; 4 km. WNW Fortín, 3200 ft., 3; Potrero Viejo [= Potrero Viejo], 7 km. W Potrero, 3; Potrero Viejo, 1700 ft., 10; 3 km. SE Orizaba, 5500 ft., 7; 3 km. N Presidio, 1500 ft., 6.

Additional records (Osgood, 1909:132, unless otherwise noted).—5 km. N Jalapa, 4500 ft. (Davis, 1944:396); Orizaba; Río Blanco.

### *Peromyscus boylii*

#### Brush Mouse

The brush mouse occurs in brush, thickets, and especially rocky places. Five kilometers north of Jalapa we took specimens in thickets of a four-foot high, purple-flowered plant. Six kilometers south-southeast of Altotonga specimens were collected in brush along a small stream, and six kilometers southwest of Zacualpilla they were in the same habitat. Four kilometers south of Jalacingo they were found in piles of mossy boulders in a pine forest. In all

of these habitats they were rather scarce. Only in the extensive lava beds within a radius of five kilometers of Las Vigas did we find this species to be common. Even there, in seemingly optimum habitat, it could not be termed abundant.

Strangely enough, this species seems rarely to occur with other species of *Peromyscus*. Six kilometers south-southeast of Altotonga, a few individuals of *Peromyscus melanotis* were taken with *boyllii*. Except at that locality, *boyllii* not only was the only species of *Peromyscus* taken in the particular areas where the traps were set, but was the only genus of mouse.

This species seems to be entirely nocturnal. We learned little of its habits. A male having enlarged testes was taken on October 16; a nursing female on October 15; a female containing three embryos on November 1. Within a radius of five kilometers of Las Vigas, several specimens were taken that had large cysts of tapeworms under the skin of the neck. The cysts were sacs filled with a colorless liquid and contained three or four tapeworms. Near Jalapa what seemed to be this same species of tapeworm was found in *Peromyscus boyllii* and *Peromyscus furvus*.

#### *Peromyscus boyllii beatae* Thomas

*Specimens examined*.—Total 45: 1 km. W Las Vigas, 8500 ft., 2; Las Vigas, 8500 ft., 13; 2 km. E Las Vigas, 8000 ft., 5; 3 km. E Las Vigas, 8000 ft., 8; 5 km. E Las Vigas, 7 (Texas Agric. and Mech. College); 10 km. SE Perote, N slope Cofre de Perote, 10,500 ft., 1 (Texas Agric. and Mech. College); Xometla Camp, Mount Orizaba, 8500 ft., 2 (British Mus.); Sta. Barbara, Mount Orizaba, 12,500 ft., 1 (British Mus.); Xuchil, 6 (Chicago N. H. Mus.).

Additional records (Osgood, 1909:155).—Perote; Orizaba; Maltrata.

For the characters of this subspecies, named in 1903 by Thomas but long regarded as inseparable from *P. b. levipes*, see Alvarez (1961:116-117).

#### *Peromyscus boyllii levipes* Merriam

*Specimens examined*.—Total 39: 2 km. N Los Jacales, 7500 ft., 8; 3 km. W Zacualpan, 6000 ft., 13; 6 km. SW Zacualpilla, 6500 ft., 5; 1 km. E Jalacingo, 6500 ft., 3; 4 km. S Jalacingo, 2; 6 km. SSE Altotonga, 9000 ft., 8.

#### *Peromyscus aztecus* (Saussure)

##### Aztec Mouse

*Specimens examined*.—Total 10 (U. S. N. M.): Jalapa, 1; Mirador, 9.

The name *Hesperomys aztecus* Saussure, 1860, was applied by Osgood (1909:156) to two specimens from Jalapa, nine specimens from Mirador, six specimens from Huachinango in the state of Puebla, and one specimen from "Mexico." He tentatively placed *aztecus* as a subspecies of *Peromyscus boyllii*. He had no intergrades and recorded no specimens of *P. b. levipes* [= *P. b. beatae*] and *P. b. aztecus* geographically nearer each other than Las Vigas (*levipes*) and Jalapa (*aztecus*). These two localities are 23 kilometers apart. We have specimens of *P. b. beatae* [= *levipes* of Osgood] from only five

kilometers north of Jalapa. There is no evidence of intergradation in the specimens from Jalapa (*aztecus*) and five miles north thereof (*P. b. beatae*). Actually (see Alvarez, 1961:115) one of the two specimens that Osgood had from Jalapa was *Peromyscus boylii* (misidentified by Osgood as *P. aztecus*) and he therefore had the two species at one locality. Consequently we think that *P. aztecus* is specifically distinct from *Peromyscus boylii*. Larger size, more cinnamon coloration, less inflation anteriorly of tympanic bullae, sharply angled (*versus* rounded) supraorbital border of frontals, elongate (*versus* round) braincase and, more evenly convex dorsal outline of skull in lateral view (nasals and frontal tending to form straight line, lowest anteriorly, in *boylii*) are characters distinguishing *Peromyscus aztecus* from all specimens from Veracruz of *Peromyscus boylii*.

### *Peromyscus bullatus* Osgood

#### Perote Mouse

*Specimens examined*.—Total 6: 3 km. W Limón, 7800 ft., 1; 3 km. W Limón, 7500 ft., 1; 2 km. W Limón, 7500 ft., 4.

*Additional record*.—Perote (Osgood, 1909:184).

Previous to 1947, this species was known only from the type locality. Nothing was known of its habits, but we supposed that it lived among rocks. Superficially it resembles the rock-loving species *Peromyscus difficilis*. In 1946 and 1947, we trapped in vain on rocky cliffs and outcrops for this species two to three kilometers west of Limón. Many specimens of *Peromyscus difficilis* were captured, but none of *bullatus*. On October 11, 1947, a small mouse resembling *difficilis* was taken in a trap set on a sandy desert flat, west of Limón. This specimen was seemingly in adult pelage, but was smaller than even the young *difficilis* in the gray coat, and differed in other respects.

When the skull was cleaned and studied, the mouse was identified as the rare *bullatus*. Returning in September, 1948, we trapped intensively on the same desert flat and obtained five additional specimens, including one adult male and an adult female.

The Perote mouse was rare; only one *bullatus* to about 50 *Peromyscus maniculatus* was taken in our traps. We took many *Peromyscus difficilis* among rocks a hundred feet from where we took *bullatus*, but it was not taken among the rocks, and not one *difficilis* was taken on the sandy flats. The specimens of *bullatus* were taken in mouse traps, baited with rolled oats and walnut, set near the sparse growth of grasses and desert weeds on the flats and dunes of fine sand. The only adult female taken was not pregnant. Three rather young mice were taken in the last week of September, indicating that the breeding season of this species is a little later than in *difficilis*.

In relation to size of skull, the auditory bullae are the largest among the species of *Peromyscus*. The greatly enlarged bullae may be a response to living on the open sandy desert. *Dipodomys*, among the heteromyids, has huge auditory bullae and lives in wind-drifted sand.

### *Peromyscus difficilis*

#### Zacatecan Deer Mouse

For a review of the subspecies of *Peromyscus difficilis* see Hoffmeister and de la Torre (1961:1-13).

This species of deer mouse is restricted to rocky places, and prefers an arid habitat. Six kilometers west-southwest of Zacualpilla we took a series of specimens in a rocky canyon and along the cliffs of a gorge. In the pine forest of the hills a few hundred yards away, only *Peromyscus boylii* was found. Two to three kilometers west of Limón, on the Perote Desert, this species was abundant in the rocky cliffs and in a lava flow, but in the sandy flats a few yards away, only *Peromyscus maniculatus* and *P. bullatus* were found. Three kilometers west of Limón, 7500 feet elevation, the mice were taken among typical desert shrubs on a white, brecciated stone cliff. Plants included yuccas of two or three species, grasses, and at least five kinds of cacti. Most prominent was the prickly pear, of the yellow-fruited type.

Three and four kilometers west of Acultzingo, a small series of these mice was taken along old rock walls. This area is a brushland, but there is arid desert to the east and west.

Many young mice of this species were taken six kilometers west-southwest of Zacualpilla in November. Relatively few young mice were taken two to three kilometers west of Limón in November, but several males there were recorded as having enlarged testes, and one female had three embryos on November 19.

### *Peromyscus difficilis amplus* Osgood

*Specimens examined*.—Total 90: 3 km. W Limón, 7500 ft., 34; 2 km. W Limón, 7500 ft., 30; Perote, 10 (U. S. N. M.); Maltrata, 3 (U. S. N. M.); 4 km. W Acultzingo, 7500 ft., 1; 3 km. W Acultzingo, 7000 ft., 12.

*Additional record*.—1½ mi. S Perote, 8500 ft. (Hooper, 1957:7).

Specimens from three kilometers west and from two kilometers west of Limón are notable for long external ears and large tympanic bullae. In 30 adults (16 males and 14 females) the ear averages fully as long as the hind foot. Actual measurements are as follows: ♂, hind foot, 25.8 (25-28); ear from notch, 26.0 (25-28); ♀, hind foot, 25.6 (25-27); ear from notch, 25.5 (23-27). Measured dry, the length of the ear is in males 21.5 (19.5-23.9), and in females 21.9 (20.0-24.2). Ten of the specimens from nearby Perote

(Osgood, 1909:182) have been examined and have similarly long external ears and large tympanic bullae. Hooper (1957:7) characterized seven specimens from 1½ miles south of Perote as having larger tympanic bullae and external ears than any other specimens seen by him of the species *P. difficilis*.

Nine adults (four males and five females) from three and four kilometers west of Acultzingo have shorter ears as is characteristic of *P. d. amplus* in several parts of its geographic range. Actual measurements are: ♂, 22.5 (21-24); ♀, 22.0 (21-23). Measured dry, the length of the ear is in males 19.4 (18.2-20.4), and in females 17.6 (16.5-18.8).

Although the specimens labeled with reference to Limón and Perote are notable for long external ears and large tympanic bullae, a few individuals from two kilometers west of Limón have shorter ears and smaller tympanic bullae, as small as certain specimens from three and four kilometers west of Acultzingo. Also, some of the 10 topotypes of *P. d. amplus* from Coixtlahuaca, Oaxaca, have long external ears and large tympanic bullae. It is concluded that the mice from Perote, 1½ mile south thereof, and from two and three miles west of Limón are not unique but are more nearly uniform in having long external ears and large tympanic bullae than are specimens from other areas.

### *Peromyscus difficilis saxicola* Hoffmeister and de la Torre

*Specimens examined*.—Total 53: 6 km. WSW Zacualpilla, 6500 ft., 51; 10 km. SW Jacales, 6500 ft., 2.

For an account of this subspecies see Hoffmeister and de la Torre (1961:10).

### *Peromyscus simulatus* Osgood

#### Jico Deer Mouse

*Specimens examined*.—Teocelo, 4500 ft., 3.

Additional record.—Near Jico, 6000 ft. (Osgood, 1909:193).

### *Peromyscus furvus* J. A. Allen and Chapman

#### Blackish Deer Mouse

*Specimens examined*.—Total 31: 5 km. N Jalapa, 4500 ft., 5; 2 km. W Jico, 4200 ft., 26.

Additional records (Osgood, 1909:197).—Jalapa; Jico.

This large mouse seems to occupy but a tiny range. Though common at Jico and Jalapa, it has not been taken elsewhere. There is no obvious barrier, geographical or ecological, to the south or north. Yet the blackish deer mouse does not occur where we trapped in the vicinity of Jico, Huatusco or Coscomatepec to the south, or at Tlapacoyan to the north. We took the species in the cool forests at the very upper edge of the upper humid division of the Tropical Life-zone. There it was trapped along rocky cliffs, in canyons, in the forest, and in coffee thickets and brushy places. It occurred with *Marmosa mexicana*, *Oryzomys palustris*, *Oryzomys alfaroi* and *Microtus quasiater*.



The blackish deer mouse seems to be entirely nocturnal; we captured no specimens in the daytime. Several were trapped in small caves in a cliff and at the entrances to holes under logs and roots of overturned trees. This species may breed all year around. In late October many young mice of various ages were trapped. Most of the larger males trapped had enlarged testes. Several females were nursing young. Each of two pregnant females contained two embryos.

Parasites seem to be rare in this species. One infestation of a tapeworm, in a cyst under the skin of the neck, was noted. Several mice had a few tiny, hard mites.

### ***Peromyscus angustirostris* Hall and Alvarez**

#### **Narrow-nosed Mouse**

*Specimens examined*.—Total 31: 3 km. W Zacualpan, 6000 ft., 24; Zacualpan, 6000 ft., 7.

The distinguishing characteristics of this recently discovered species are enumerated in the original description (Hall and Alvarez, 1961:203). M. Raymond Lee obtained all of the known specimens from an area supporting long-needled pine and trapped most of the specimens around rocks and water seeps.

### ***Peromyscus mexicanus***

#### **Mexican Deer Mouse**

The Mexican deer mouse is a forest-living species. It is the commonest mammal taken in the deep jungle of the upper humid division of the Tropical Life-zone, and in many places is the only small mammal taken in the collectors' traps. In the limestone areas, where numerous cliffs and boulders lie scattered on the ground beneath tall trees, a mouse of this species may be taken in almost every trap set. On the open, bare forest floor, where there are few fallen logs and little underbrush, Mexican deer mice are much scarcer. On the coastal plain they are generally uncommon, occurring in thickets and jungles that fringe the rivers and watercourses.

When these mice are unusually abundant in the forest, a few individuals may wander into thickets and weeds at the forest edge, and even into clearings. Mexican deer mice found in such locations are usually young. Not uncommonly, the species is taken in cornfields in which the ground is clean and the cornstalks are tall and dense. There we took this species along with *Liomys pictus* and *Liomys irroratus*—species with which the Mexican deer mouse otherwise rarely comes in contact. Later in the year, when the milpas grow up in grass and weeds, the Mexican deer mice leave

the fields, and grass-loving forms of small mammals enter the fields. In their forest habitat, the Mexican deer mice commonly are taken with *Oryzomys alfaroi* and *Oryzomys melanotis* and along the edges of the forests with *Peromyscus leucopus*.

This species is nocturnal. Twice we saw individuals in the day, but both times in the gloom of caves. One very young animal was taken in a trap at midday.

The Mexican deer mouse feeds on seeds and fruits. Coffee berries are eaten, and small caches of dry coffee husks, each husk having a hole eaten in the side, are often found in the forest. Usually these caches are beneath rocks. The inside of the pit of the jobo plum is eaten, as well as the pulp. Several specimens had their chins and chests stained a deep red or deep purple, seemingly from the juice of some fruit or berry. Several mice were taken that had lost parts of their tails and the stumps had healed completely.

Some breeding records for this species are as follows:

Jan. 11—four breeding males;	Oct. 28—nursing female;
Feb. 2—two breeding males;	Nov. 2—two breeding males;
baby mouse;	Nov. 3—three embryos;
March 5—baby mouse;	Nov. 4—three embryos;
May 29—two embryos;	Nov. 16—three embryos;
two embryos;	Dec. 1—baby mouse;
Sept. 28—two embryos; nursing	Dec. 2—two embryos;
female; five breeding males;	nursing female;
Sept. 30—two embryos;	Dec. 5—nursing female;
two embryos;	Dec. 12—two breeding males;
Oct. 22—nursing female;	Dec. 13—three embryos.
two breeding males;	

One specimen "had a strange growth on the head, which came off and was lost. The skull beneath was much distorted." Several mice were taken that had growths, perhaps parasites or eggs of parasites, at the bases of the whiskers, in the flesh. These were white granules, one to two millimeters in diameter. No structure could be noted. These objects were free in the flesh, and readily slipped out when flesh of a mouse's nose was pinched. Another mouse had "two large tapeworms, about four inches long, white, thin, and with a scolex about two millimeters in diameter, under the skin of the throat. These were not in a cyst, but free and active." Other records of parasites include:

"number of small ticks";	"several small, dark-brown, hard,
"one flea";	slow-moving mites";
"two small black fleas";	"eight or ten small red mites";
"a few small, fast-moving mites";	"two small, fast-moving red mites";
"one small tick";	"about four small mites on
"three tiny red mites in ear";	each mouse".

**Peromyscus mexicanus mexicanus** (Saussure)

*Specimens examined*.—Total 200: Piedras Clavadas, 75 km. NW Tuxpan, 6; 35 km. NW Tuxpan, 1; 25 km. NW Tuxpan, 2; 14 km. NW Tuxpan, 1; 3 km. W Gutierrez Zamora, 300 ft., 3; 9 km. E Papantla, 300 ft., 4; 3 km. SE San Marcos, 200 ft., 23; 7 km. NNW Cerro Gordo, 1; Teocelo, 4500 ft., 21; Puente Nacional, 500 ft., 6; Mirador, 3500 ft., 7; 15 km. ENE Tlacotepec, 1500 ft., 11; Río Atoyac, 8 km. NW Potrero, 29; 7 km. NW Potrero, 1700 ft., 5; 4 km. WNW Fortín, 3200 ft., 11; 15 km. ESE San Juan de la Punta, 400 ft., 9; Río Blanco, 20 km. WNW Piedras Negras, 4; Río Blanco, 20 km. W Piedras Negras, 400 ft., 11; 3 km. N Presidio, 1500 ft., 12; 2 km. N Motzorongo, 1500 ft., 15; 3 km. E San Andrés Tuxtla, 1000 ft., 13; 5 mi. S Catemaco, 5.

Additional records (Osgood, 1909:201).—Otatitlán; Lagunas; Pasa Nueva; Achotal; Carrizal; Catemaco; between Papantla and El Tajin (Ingles, 1959:397).

**Peromyscus mexicanus teapensis** Osgood

*Specimens examined*.—Total 9: 15 km. SW Jimba, 750 ft., 1; 14 km. SW Coatzacoalcos, 100 ft., 6; Jesús Carranza, 250 ft., 1; 63 km. ESE Jesús Carranza, 500 ft., 1.

**Peromyscus mexicanus totontepecus** Merriam

*Specimens examined*.—Total 22: 7 km. W El Brinco, 800 ft., 8; Cautlapan [= Cuautlapan], 4000 ft., 2; 3 km. SE Orizaba, 5500 ft., 12.

**Peromyscus nelsoni** Merriam

## Nelson's Deer Mouse

*Specimens examined*.—Jico, 2 (U. S. N. M.).

**Baiomys taylori**

## Northern Pygmy Mouse

See Packard (1960:579-670) for details of the taxonomy and geographic distribution of *Baiomys*.

At Potrero [del] Llano we found two of these mice in the stomach of a boa constrictor and another in the stomach of a king snake (*Lampropeltis polyzona*).

**Baiomys taylori analogus** (Osgood)

Record.—Acultzingo (Packard, 1960:639; see his account for a treatment of this subspecies).

**Baiomys taylori taylori** (Thomas)

*Specimens examined*.—Total 24: 19 mi. W Tampico, 1; 5 mi. S Tampico, 5; Tampico Alto, 50 ft., 2; 1 mi. E Higo, 500 ft., 3; Ozuluama, 500 ft., 2; Platón Sánchez, 800 ft., 1; Cerro Azul, 350 ft., 4; Potrero [del] Llano, 350 ft., 6.

**Baiomys musculus brunneus** (J. A. Allen and Chapman)

## Southern Pygmy Mouse

*Specimens examined*.—Total 91: 7 km. NNW Cerro Gordo, 19; Teocelo, 4500 ft., 1; Puente Nacional, 500 ft., 2; 3 km. W Boca del Río, 10 ft., 8; 4 km. WNW Fortín, 3200 ft., 6; Río Atoyac, 8 km. NW Potrero, 1; 2 km. N Paraje Nuevo, 1700 ft., 13; Potrero Viejo, 1700 ft., 15; Cautlapan [= Cuaut-

lapan], 4000 ft., 16; 1 km. E Mecayucan, 200 ft., 1; 3 km. SE Orizaba, 5500 ft., 3; Río Blanco, 20 km. WNW Piedras Negras, 4; 3 km. N Presidio, 1500 ft., 2.

Additional records (Packard, 1960:614).—2 mi. NW Plan del Río, 1000 ft.; Plan del Río, 1000 ft.; Carrizal; Chichicaxtle; Sta. María, near Mirador, 1800 ft.; Boca del Río, 10 ft.; Cordoba; 29 km. SE Cordoba; Presidio. (Packard's, *op. cit.*, systematic treatment of *Baiomys* should be consulted for nomenclature and information on geographic distribution.)

Pygmy mice prefer low, dense vegetation such as grasses, sawgrass, weeds, succulent plants along the borders of small streams, and dense thickets. Occasionally they are found in relatively open brushland, especially if the brush be thorny species, but rarely are common there. At the edges of clearings or other places where the species may be locally abundant, they may stray into the jungle for short distances, but rarely for more than a few yards.

Perhaps the favored habitat of this species in Veracruz, and the place where the greater part of our specimens was taken, is in the narrow borders of brush, weeds and grasses at the edges of fields. In Veracruz, the distribution of this species is irregular; in many apparently suitable localities we failed to find it. Usually, however, if present at all, the mice were numerous.

Usually the pygmy mouse was found with other grass-living forms, such as harvest mice (*Reithrodontomys*), the pygmy rice rat (*Oryzomys fulvescens*) and the cotton rat (*Sigmodon hispidus*). When pygmy mice are abundant, their presence may be detected by their tiny runways in the grass and weeds. Piles of tiny droppings, characteristically green, occur at intervals along these runways. Often this species is trapped in the larger runways of *Sigmodon hispidus*. In a few places, where pygmy mice were rare, we found no evidence of their presence, such as runways or piles of droppings. In such cases we usually took only one or two specimens at a locality. The distribution by months of embryos (one to four per female) suggests that the species breeds throughout the year.

At Potrero Viejo this species was commonly killed by house cats.

We found few parasites on *Baiomys*. One individual was noted as having a few mites.

### **Sigmodon hispidus**

#### Hispid Cotton Rat

The hispid cotton rat is a grass-loving species that occupies grasslands, overgrown clearings, weed-grown borders of fields and brushy areas. It prefers dense growths of sacate (sawgrass or bunchgrass). Rarely it strays a short distance, usually not more

than 50 feet, into jungle or forest when these border the more normal habitat.

The cotton rat is both diurnal and nocturnal. More specimens can be trapped by day than by night. In one day, a "few" were trapped between 9:00 a. m. and 1:00 p. m.; seven between 1:00 p. m. and 5:00 p. m.; three in the following night; four the next morning.

These rats construct broad trails through dense grass and other thick cover. In bunchgrass, there is usually enough space between the clumps of grass and roots to serve as runways, and runways are not extensively constructed there.

In some places the cotton rat does considerable damage to sugar cane, especially young plants. When the rats become extremely abundant, as they were in 1947 near Potrero, control measures sometimes are taken. The Potrero Sugar Company resorted to poison. Cotton rats also destroy a great deal of stored corn, and damage beans. The natives trap the rats by means of a clever deadfall. This consists of two sticks pushed into the ground about six inches apart. A strand of sawgrass is tied between these sticks, about six inches from the ground. In the center of the strand of grass, a single kernel of corn is tied in a half-hitch in the grass. A flat rock is leaned against the grass with the part above the grass about four inches from the ground. The cotton rat enters beneath the rock, cuts the strand of grass in order to obtain the corn, and thus releases the rock that falls and crushes the rat.

Cotton rats breed throughout the year. Young are more common than adults in every locality where we found this species. Some breeding records are as follows:

Jan. 10—breeding male;	Sept. 27—two embryos; five females
Feb. 2—four embryos;	with three embryos each;
Feb. 9—breeding male;	Oct. 12—seven embryos;
Feb. 12—three embryos;	Nov. 2—three breeding males;
March 13—breeding male;	Nov. 4—three embryos;
March 23—two embryos;	Nov. 14—three embryos; four
May 15—breeding male;	embryos;
May 16—three breeding males;	Nov. 15—three embryos;
May 30—nursing female;	Dec. 1—breeding male;
	Dec. 11—two breeding males.

Three trapped cotton rats had lost parts of their tails in life, and the stumps had completely healed. One specimen had an infection of the shoulder, seemingly the result of a fly larva. Ectoparasites are not common on cotton rats. Listed were: "two or three small ticks"; "six to ten small mites, seemingly of two species"; "large bot fly larva in center of back"; "translucent bot fly larva, 10 millimeters



long, four millimeters wide, three millimeters high, in center of back"; "a large tick in the fur of the back"; "two or three tiny brown and white mites."

At a place 15 kilometers east-northeast of Tlacotepec an assistant brought into camp about 25 small mammal skulls and fragments of skulls. These he had found in a cave, beneath the roost of an owl. The skulls had weathered out of owl pellets. All the skulls were of the cotton rat.

### *Sigmodon hispidus saturatus* Bailey

*Specimens examined*.—Total 58: 3 km. E San Andrés Tuxtla, 1000 ft., 11; Catemaco, 1 (U. S. N. M.); Coatzacoalcos, 6 (U. S. N. M.); 14 km. SW Coatzacoalcos, 100 ft., 9; 10 km. NW Minititlan [= Minatitlán], 100 ft., 1; Achotal, 8 (Chicago N. H. Mus.); 35 km. ENE Jesús Carranza, 150 ft., 6; Jesús Carranza, 250 ft., 1; 20 km. E Jesús Carranza, 250 ft., 10; 55 km. ESE Jesús Carranza, 450 ft., 3; 25 km. SE Jesús Carranza, 250 ft., 2.

Additional record.—Pasa Nueva (Allen, 1904:31).

### *Sigmodon hispidus toltecus* (Saussure)

*Specimens examined*.—Total 304: Tampico Alto, 50 ft., 1; 19 mi. W Tampico on Highway 110, 17; 16 mi. (by road) W Tampico on Highway 110, 5; 5 mi. S Tampico, 11; S end Isla Juana Ramírez, in Laguna Tamiahua, 7; Hacienda Tamiahua, Cabo Rojo, 10; Isla Burros, Laguna de Tamiahua, 5; La Mar, 20 ft., 1; Platón Sánchez, 800 ft., 7; Ixcatepec, 70 km. NW Tuxpan, 1; Potrero Llano [= Potrero del Llano], 350 ft., 17; 35 km. NW Tuxpan, 4; 17 km. NW Tuxpan, 2; 6 km. N Tuxpan, 6; 4 km. N Tuxpan, 2; 4 km. NE Tuxpan, 4; San Isidro, 100 ft., 3; 12½ mi. N. Tihuatlán, 300 ft., 20; 5 km. S Tehuatlan [= Tihuatlán], 700 ft., 10; 3 km. W Gutierrez Zamora, 300 ft., 1; 3 km. SW San Marcos, 200 ft., 13; Chichicaxtle, 4 (U. S. N. M.); 7 km. NNW Cerro Gordo, 32; Jico 6 (U. S. N. M.); Mirador, 3500 ft., 2 (1 in U. S. N. M.); 15 km. ENE Tlacotepec, 1500 ft., 15; 3 km. SW Boca del Río, 10 ft., 1; 5 km. SW Boca del Río, 1; Río Atoyac, 8 km. NW Potrero, 4; 7 km. NW Potrero, 1700 ft., 1; 2 km. N Paraje Nuevo, 1700 ft., 4; Potrero Viejo, 1700 ft., 3; Orizaba, 24 (U. S. N. M. 17, Chicago N. H. Mus. 7); 15 km. ESE San Juan de la Punta, 400 ft., 14; 7 km. SE San Juan de la Punta, 400 ft., 6; Río Blanco, 20 km. WNW Piedras Negras, 8; 3 km. N Presidio, 1500 ft., 9; 2 km. N Motzorongo, 1500 ft., 4; Motzorongo, 12 (U. S. N. M.); Tlacotalpan, 2 (U. S. N. M.); Otatitlán, 5 (U. S. N. M.).

Additional records.—El Tajin (Ingles, 1959:398); Jalapa (Allen and Chapman, 1897:207); Mt. Orizaba (Elliot, 1907:247).

Of the 14 skins from 19 miles west of Tampico, three are pale as is characteristic of *S. h. berlandieri*; the other 11 are darker as is characteristic of *S. h. toltecus*.

Three insular populations deserve comment. The ten individuals from the population on Cabo Rojo (Hacienda Tamiahua), the big off-shore barrier beach, have dark-colored sides, are larger than individuals of the other two insular populations, seem to have larger external ears than even the mainland animals, and in comparison with the latter further differ as follows: anterior part of glenoid surface of squamosal bone more angled; squamosal arm of zygomatic arch deeper (vertically); auditory bullae larger; bulla in contact with paroccipital process (rarely so in animals of same size from mainland); supraorbital crest higher.

Seven specimens from the south end of Isla Juana Ramírez in the Laguna de Tamiahua, have paler sides than animals from either of the other two insular populations or than animals from the mainland.

Five specimens from Isla Burros, in the Laguna de Tamiahua, are the smallest, and have more ochraceous underparts (on the average) than other specimens.

The differences mentioned above exist between specimens of the same sex having about the same degree of wear on their molar teeth, and obtained and prepared at the same time of year (March 31-April 5).

The variations may deserve subspecific recognition.

### *Neotomodon alstoni perotensis* Merriam

#### Volcano Mouse

*Specimens examined*.—Total 68: Las Vigas, 1 (U. S. N. M.); Perote, 1 (U. S. N. M.); Cofre de Perote, 5 (U. S. N. M.); 1 km. NW Pescados, 10,500 ft., 61.

Additional record.—Cofre de Perote, 10,500 ft. (Davis, 1944:398).

The volcano mouse is most abundant in the meadows of zacaton grass at high elevations on the mountains. It is less common about rocky outcrops and in marshes, but does occur in such places, and even was found on some occasions in the open pine forest. At the high altitudes where this species lives, the nights are cool or cold; frost occurs almost nightly in winter and snow is not uncommon. On the Cofre de Perote we found the volcano mouse associated with the black-eared deer mouse (*Peromyscus melanotis*) and the western harvest mouse (*Reithrodontomys megalotis*). The volcano mouse was more common than the other species, outnumbering the two combined by more than five to one in our traps. In mid-November we took an average of one volcano mouse to each five traps set.

On the Cofre de Perote, one kilometer northwest of Pescados, we took six volcano mice in a small area of zacaton grass, isolated from the main meadow. Because we had taken no other species in this area, we searched there for the nest of the volcano mouse that afternoon. We picked up the trail of the mouse where it had been trapped, between two clumps of zacaton beside a pine log. We first cut away all the grass of the clump nearest the pine log. A runway completely circled the clump at its base, inside the circle of down-drooping dead grass. An entrance to this circle was on the side away from the pine log, but no others were found. We cut the head of grass off, level with the ground, and bisected it. Much soil was mixed with the grass, and the punky center would have made a good place for the nest, as would the punky root mass. We scraped away the earth, and found, beneath an inch

of packed loam, packed sand. There was no underground burrow. We then repeated the process with the adjoining clump of zacaton. This one was larger. Three holes entered the clump, and joined with the ring runway. This clump also had two chambers outside the ring, about six inches long by three wide, with a dry, soft earth floor. These were on the surface of the ground, just inside the down-drooping circle of grass blades. This clump also was excavated and bisected, but no nest or underground burrow was found. The third clump was double, with a narrow neck so riddled with burrows as almost to form two separate clumps. The ring runway about the smaller was not complete. It ended to the outside at one end, and in several places it joined the runways through the neck. The other section had a complete ring, joined to the runway through the neck, two chambers, and at least three runways from the ring to the outside. It was excavated but no burrow or nest was found. Between the clump and a rock two feet long by one foot long, we found a burrow, only partially concealed by grass. It measured one and seven-eighths inches at the mouth, and about one and one half inches throughout its length of about six feet. It descended to a depth of about four inches, passed around the rock, and branched. One branch ended eight inches away. The other continued for a foot, then abruptly went down between two rocks. At a depth of about 14 inches, it branched again. One branch rose gradually, in a distance of two feet, and stopped under a rock about one foot by six inches by six inches. The other branch passed beneath a rock about two feet by 18 inches, after which the branch ascended on the other side, and at a depth of four inches, entered the nest, which was a hollow ball of dry grass, five inches in diameter, having a central cavity two and one half inches in diameter. The nest was notably soft, and could not be lifted out in one piece. It was in a cavity, half in the earth and half in the roots of a clump of zacaton. By cutting away the opposite side of the clump of zacaton, we exposed the nest for a photograph.

In November, few evidences of breeding were noticed in the mice trapped. One female had two embryos. One young mouse was taken. The testes of all of the males were small and abdominal.

Few parasites were noted on volcano mice. There was an average of one small mite to each three mice. One rattlesnake (*Crotalus triseriatus anahuacus*) was found in the zacaton meadow. No other signs of predators were noted. We saw no hawks or owls in the course of our stay at the Cofre de Perote.

**Neotoma nelsoni** Goldman

## Nelson's Wood Rat

*Specimens examined*.—Perote, 11 (U. S. N. M., including type).

Nelson and Goldman found this rat in the cactus at Perote. The cactus is now nearly gone, as a result of clearing the desert for wheat, corn and maguey. We failed to take specimens.

**Neotoma mexicana**

## Mexican Wood Rat

On the desert three kilometers west of Limón we found signs of wood rats in small caves in the conglomerate rock of the small canyons and in an extensive lava flow. The rats refused all baits, even dry prunes. One young animal was shot at night.

Two and three kilometers east of Las Vigas, wood rats were fairly common in the recent lava flow. Their distribution was rather spotty. We found numerous signs about some large piles of boulders and in caves in the low cliffs. In other places, seemingly identical in all aspects, and nearby, there were no signs of occupancy by the rats. The rats were difficult to trap. They refused all baits save dry prunes, and even prunes were often refused. We took a small series after considerable effort.

In the lava within three kilometers of Las Vigas we found a few small, old signs of wood rats in deep caves. A few small stick piles, doubtless made by wood rats, were seen in crevices in rocks. These seemed not to be nests, but piles made only in response to the nest-building habit or instinct, so highly developed in some species of wood rats farther north.

Our specimens labeled with respect to Las Vigas include four adult females. None was pregnant on October 5 or 13. One old male had enlarged testes on November 3. A young rat was taken on October 12. No ectoparasites were noted on wood rats from Veracruz.

**Neotoma mexicana distincta** Bangs

*Specimen examined*.—Texolo [= Teocelo], 1 (U. S. N. M.).

**Neotoma mexicana torquata** Ward

*Specimens examined*.—Total 12: 3 km. W Limón, 7800 ft., 1; Cofre de Perote, 9500 ft., 2 (U. S. N. M.); Las Vigas, 8500 ft., 6; 2 km. E Las Vigas, 8000 ft., 2; 3 km. E Las Vigas, 8000 ft., 1.

**Microtus mexicanus mexicanus** (Saussure)

## Mexican Vole

*Specimens examined*.—Total 128: 6 km. SSE Altotonga, 9000 ft., 2; Las Vigas, 8500 ft., 67; 1 km. W Las Vigas, 8500 ft., 10; Las Vigas, 7400-8000 ft., 11 (U. S. N. M.); 3 km. E Las Vigas, 8000 ft., 3; 2 km. N Perote, 8000 ft., 2; Perote, 3 (U. S. N. M.); 2 km. W Perote, 8000 ft., 3; Cofre de Perote, 26 (U. S. N. M.); 4 mi. SW Acultzingo, 7000 ft., 1.

In Veracruz this vole lives in cool, damp places along the rim of the plateau and occupies a zonally higher area than does the pine vole. The latter lives at the upper edge of the upper humid division of the Tropical Life-zone, whereas *M. mexicanus* lives in the next higher zone. *M. quasiater* lives in the oak forest association of tropical vegetation. Commonly a few pine trees extend down to or nearly to *quasiater* habitat. *M. mexicanus* occupies the pine forest habitat. The two species closely resemble each other in both habits and general appearance.

Our largest series of *mexicanus* was taken in the northern part of Las Vigas. There a few were trapped in a zacaton meadow, a number along the long rows of maguey plants and the greatest number in a deep, cool canyon. This canyon, at the northern edge of the town of Las Vigas, is in a beautiful pine forest. The canyon is deep, with steep sides about 200 feet high. These canyon sides are covered, beneath the tall pines, with a deep mat of thin-bladed grasses and moss. Near the stream, the ground is covered with a mat of almost pure moss about a foot deep. In the grass and moss we found literally thousands of tiny runways. Traps set in these runways took large numbers of shrews (*Cryptotis* and *Sorex*) and voles. Other than these mammals, the only species taken was the western harvest mouse (*Reithrodontomys megalotis*), of which we took two.

Our attempts to map the runways of *Microtus* were given up; there were simply too many intersections and runways in the area. In addition to the runways through the moss, there were many burrows in the ground. These probably led to nests, but we did not find any; the rocks in this area were too heavy and deeply sunken to move.

In the pine forest above, however, voles were less common. There we were able to follow the runways in the short grass that was grazed by goats to within about two inches of the ground. Most of the runways in the grass were short, three to four feet in length, with several branches not more than two feet in length. We judged that there were about four branches to the average run-



way. One runway was nearly 20 feet long. Most runways were sinuous, but rarely had sharp turns, and usually each runway kept its general direction throughout its length. Each runway and subsidiary runway terminated in a shallow trough, showing that the vole there emerged to move about on, rather than through, the grass. The runways were trough-shaped, about one and one-quarter inches wide. Usually three or four radiated from a common center, the burrow.

The burrows were about one inch in diameter, widening in places to as much as three inches. We did not excavate those that led into the ground. Many led under logs that we rolled aside. The runways beneath the logs resembled those in the grass except that there were more branches beneath the logs. Many of the short branches, or pockets, and the runways themselves were wider than the runways through the grass. In general, there was one long burrow parallel with the long axis of the log, with two or three short branches leading to the edge of the log. From each of these, runways radiated off through the grass.

Some of these runways had no nests, or if present, the nests were underground. Often there were burrows leading down into the ground beneath the logs. Many runways did have nests. In some of these we were able to catch voles. The nests were all of a common pattern: a relatively deep pocket in the ground, near the center of the log. One side of this pocket would be dug in sideways, and roofed over with a thin layer of earth between the nest and the log. This side pocket was filled with a large ball of soft, dry grass. Nests were about six to eight inches in diameter transversely and four to five inches in depth. There was a single entrance, and an interior cavity about three and one half inches in diameter.

Two kilometers west of Perote, we found voles living in maguey cercas, on the open desert, but the voles were rather uncommon in such places.

Some breeding records for this species are:

Sept. 28—three embryos;	Oct. 19—nursing female;
Oct. 8—nursing female; three embryos;	Oct. 20—three embryos; nursing female;
Oct. 14—three embryos;	Nov. 3—nursing female having three embryos;
Oct. 15—nursing female having one embryo; female with two embryos;	Nov. 11—breeding male.

We took one or two young voles almost every day near Las Vigas, but it was obvious that breeding was not common in winter.

**Microtus quasiater (Coues)**

## Jalapan Pine Vole

*Specimens examined.*—Total 74: 4 km. W Tlapacoyan, 1700 ft., 11; 5 km. N Jalapa, 4500 ft., 32; Teocelo, 4500 ft., 28; Huatusco, 5000 ft., 1; 4 km. WNW Fortín, 3200 ft., 1; 3 km. SE Orizaba, 5500 ft., 1.

*Additional records.*—Jalapa (Coues, 1874:192, type locality); Jico (Bailey, 1900:67); Orizaba (Hall and Cockrum, 1953:452); Tuxpango (Coues, 1874:192).

The normal habitat of the Jalapan pine vole in Veracruz is marshy meadows and grassy swales, from 3000 to 5500 feet in elevation. Four miles west-northwest of Fortín, one was taken in a marsh. Three kilometers southeast of Orizaba, one was trapped in damp grass beside a sugar cane field. Four kilometers west of Tlapacoyan, a small series of specimens was taken in damp grasses and succulent plants beside a tiny stream in a cool canyon. At Teocelo, specimens were taken in a meadow, beside a small, cool stream, and in grasses and weeds along the borders of fields. Ordinarily, the pine vole is found in the same places as rice rats (*Oryzomys*), harvest mice (*Reithrodontomys*) and shrews (*Cryptotis*). Five kilometers north of Jalapa, in October, 1946, the pine voles were extraordinarily abundant. From their more normal habitat they had spread out to thickets, dry hillsides, rock piles and rock walls, and even to the forest.

This species is principally nocturnal. About 75 per cent of our specimens were taken in the night. The habits of the pine vole in Veracruz are much like those of some meadow voles (subgenus *Microtus*) in the United States. They make distinct, groove-like runways in dense vegetation, and dig burrows under rocks and logs. Their runways are surprisingly narrow, being only about an inch in width. A nest found in a pine vole runway under a log was old and abandoned, although the burrow leading to it seemed to have been in use recently. The nest was a ball of dead grasses, about three inches in diameter.

The food of the pine vole consists principally of the roots and bases of the stalks of annuals. Some grass must be eaten, for we found cut blades lying in runways on numerous occasions. All stomachs that were examined had only granular, starchy vegetation, usually dull white but often stained dark brown or blackish in places. No green food was noted.

In mid-October we took a number of pregnant and nursing female pine voles. Twelve pregnant females, taken from October 14 to October 20, had from one to four embryos, with an average (mean) of 2.1.

Ectoparasites are not common on pine voles. On several occasions a few small brown mites were noticed. Tiny, orange-colored mites were seen in clusters on the ears of three or four voles. One pine vole had a tick in the ear and another had a translucent cyst under the skin of the foreleg. When opened, the cyst was found to contain seven tapeworms with large scolices, five millimeters in diameter, and short bodies, ten millimeters in length. One vole had a scar on the shoulder, perhaps from a fight with another pine vole. Two drowned pine voles were found in a tiny, steep-walled pool of water.

### Family Muridae

#### **Rattus rattus**

##### Black Rat

In Veracruz, as far as our records go, this species occupies a rather unusual habitat. We never found it in the larger towns and cities. Neither did we find it, or any other house rat, living apart from man's dwellings. All of the specimens of black rats collected and observed were in small villages and isolated houses in the country. In the village of Potrero Viejo, 1700 feet elevation, both the black rat (*R. r. rattus*) and the roof rat (*R. r. alexandrinus*) are found. The black rats were found in smaller houses and buildings at the edge of the town, and the roof rats in the town itself. Neither was taken in the cane fields near the village.

#### **Rattus rattus alexandrinus** (É. Geoffroy Saint-Hilaire)

*Specimens examined*.—Total 8: Las Vigas, 8500 ft., 1; Potrero Viejo, 1700 ft., 7.

#### **Rattus rattus rattus** (Linnaeus)

*Specimens examined*.—Total 4: Río Atoyac, 8 km. NW Potrero, 1700 ft., 1; Jesús Carranza, 250 ft., 2; 20 km. E Jesús Carranza, 300 ft., 2.

#### **Rattus norvegicus norvegicus** (Berkenhout)

##### Norway Rat

We obtained no specimens of the Norway rat in the state of Veracruz, and doubt that it occurs in the tropics there. The species is included here on the basis of a dead specimen, whose head had been crushed by a car, seen and examined but not saved, on the street at Perote.

**Mus musculus and subspecies**

## House Mouse

*Specimens examined.*—Total 24: El Cepillo, 20 ft., 1; Hacienda Tamiahua, Cabo Rojo, 1; 10 km. SW Jacales, 6500 ft., 2; 3 km. SW San Marcos, 200 ft., 1; Las Vigas, 8500 ft., 2; 1 km. W Las Vigas, 8500 ft., 1; Perote, 8000 ft., 1; 5 km. N Jalapa, 4500 ft., 4; Teocelo, 4000 ft., 1; Mirador, 3500 ft., 2; 3 km. SE Orizaba, 5500 ft., 1; Río Atoyac, 8 km. NW Potrero, 1; Potrero Viejo, 1700 ft., 2; 3 km. W Acultzingo, 7000 ft., 2; 3 km. E San Andrés Tuxtla, 1000 ft., 2.

House mice are found in the wild almost throughout the state of Veracruz. Only in the jungles of the extreme south did we fail to find them.

Five kilometers north of Jalapa we made special efforts to secure house mice from the fields, and four specimens were taken. These are topotypes of the subspecies *M. m. jalapae* Allen and Chapman. But they do not answer the description of *jalapae*, lacking the broad band of black on the back. Instead they are like *M. m. brevisrostris*. Specimens from elsewhere in the state of Veracruz do have the color of *jalapae*, but are smaller than that subspecies as it was described. Further, at Potrero Viejo, specimens having the color pattern ascribed to *jalapae* and that ascribed to *brevisrostris* both were taken in the same house.

Probably the house mice of Veracruz have been present for more than four hundred years. Much shifting of the populations probably has taken place. However that may have been, our small series of house mice from Veracruz shows wide variation in color.

## Family Erethizontidae

**Coendou mexicanus mexicanus (Kerr)**

## Mexican Porcupine

*Specimens examined.*—Total 14: Río Blanco, 20 km. WNW Piedras Negras, 300 ft., 4; 15 km. W Piedras Negras, 300 ft., 1; 3 km. E San Andrés Tuxtla, 1000 ft., 2; Catemaco, 2 (U. S. N. M.); 10 km. NW Minititlan [= Minatitlán], 100 ft., 1; Minititlan [= Minatitlán], 1 (U. S. N. M.); Achotal, 1 (Chicago N. H. Mus.); 20 km. E Jesús Carranza, 300 ft., 1; 25 km. SE Jesús Carranza, 250 ft., 1.

Additional record.—Jalapa (Ferrari-Pérez, 1886:130).

The abundant, short, yellow or white spines give the Mexican porcupine the appearance of being a large black animal with a white head. This is especially so at night or when the animal is some distance away from the observer.

The only name we heard applied to the porcupine in Veracruz was "puercoespín." We found the animal to be uncommon, or at least inconspicuous. Several were obtained in the dense jungles that flank the arroyos and water courses on the coastal plain. A few were taken in the dense jungles of the lower humid division of the Tropical Life-zone in southern Veracruz. Two were taken in the upper humid division of the Tropical Life-zone of the Tuxtla Mountains.

All but one of our porcupines were taken in tall trees, 60 to 100 feet from the ground. All were in trees densely hung with vines. One female was in a tree only about 40 feet high, and the porcupine was only about 20 feet from the ground. One man showed us a tree not over 10 feet high, in which he had seen a porcupine.

On the south bank of the Río Blanco, 20 kilometers west-northwest of Piedras Negras, on March 17, 1946, "I was hunting chachalacas and other specimens with some Mexican friends. We were going along the bank of a small arroyo where thorny trees were quite dense and rather high. One of the men pointed into a tree and began to talk rather excitedly. I thought it must be an iguana in the tree. They said no, that it was another animal and tried to point it out to me. I was unable to see it, and told them to shoot it with a .22 rifle. They fired and a large porcupine came into sight from the top of a large limb, where it had been lying vertically, hidden from view unless one moved about a good deal. It slowly began to slide down the tree, its prehensile tail tip curling. It was very hard to skin because there are more quills on the belly of this genus than there are on the North American porcupine. The tail skin was extremely thick and tough. I had to cut it out to the tip, and even then it would skin only with great difficulty, and the tip actually was broken off. I broke two needles in trying to sew up the tail. I had to use the pliers to drive the needle through the tail skin."

Another specimen was taken at the same locality a month later. "It was in an extremely dense tree. There was no evidence from the ground that there was an animal in the tree. I looked and found no droppings or scraps of bark. It was such a good looking animal tree that Vicente volunteered to climb it. I was not particularly surprised when he shouted that there was a porcupine. His instinct as to which trees contain animals is surprising. He forced the animal out on a limb by jerking on vines and giving a menacing growl. The animal came out on Gerardo's side of the tree, and he fired, bringing it down with one shot. It is a large non-pregnant female." The following day, May 19, a very young porcupine and a half-grown animal were obtained.

At a place ten kilometers northwest of Minatitlán, on February 6, 1947, "While night-hunting, we heard howler monkeys in the jungle and found one in a tall tree. I shot it. A few moments later Gerardo shouted that he saw another one in the same tree, and that it had a white head. I thought at once of capuchins, and told him to shoot it. He did not want to, saying that it was small. I



told him to go ahead, that it might be a different kind. He fired, but nothing happened. A few minutes later I saw a pair of bright red eyes, high in the tree. The eyes were far too bright for a howler, so I fired, and brought down a porcupine. Two more monkeys were taken from the same tree."

Three kilometers east of San Andrés Tuxtla on January 13, 1948, "A large porcupine was shot last night while it was feeding in a capulin tree, between showers of heavy rain. The animal's eyes had a dull red glow.

"It is a female with one nearly full-term embryo, which I saved in alcohol. The mammae are all pectoral. There is a penislike structure anterior to the vagina—a flattened cartilaginous structure similar to that of *Tylomys*. The animal was rather fat. The stomach was crammed with capulin fruit. No ectoparasites were noted on it."

At the same locality on January 18, "another female porcupine was shot from the same tree as the above. It was feeding on the fruit about one hour after dark. It was on a branch about four inches in diameter and 15 feet from the main trunk and 30 feet from the ground. Its eyes had a dull, red glow. The white head was conspicuous in the beam of the light.

"This specimen is not pregnant, and lacks the penislike structure that the pregnant female had. The animal is not fat. One large tick was the only ectoparasite noted. A number of white nematodes about an inch long were free in the body cavity."

A specimen taken 20 kilometers east of Jesús Carranza on April 6, 1948, yielded a large, tough-skinned, dark brown, bot fly larva and a large tick.

#### Family Dasyproctidae

#### *Agouti paca nelsoni* Goldman

#### Paca or Spotted Paca

*Specimens examined*.—Total 10: Río Blanco, 15 km. W Piedras Negras, 350 ft., 1; Catemaco, 3 (U. S. N. M.); Boca del Río Chalchijapa, 20 km. E Jesús Carranza, 1; 20 km. ENE Jesús Carranza, 200 ft., 2; 13 km. ESE Jesús Carranza, 350 ft., 1; 25 km. SE Jesús Carranza, 250 ft., 1; 30 km. SSE Jesús Carranza, 300 ft., 1.

Additional record.—Chichicaxtle (Goldman, 1913:10).

In central and southern Veracruz, the paca is called "tepezcutinte," but in northern Veracruz is called "tuza," "tuza real" or "cuautuza." In the same areas the pocket gopher (*Heterogeomys*) is called "tuza de tierra."

The paca inhabits the tropical parts of Veracruz, from sea level to at least 5000 feet elevation. It prefers low, dense jungle and cover near streams. It is rare almost everywhere, and especially so in inhabited areas, because it is much hunted for food. The price of the flesh of the paca far exceeds that of any other meat, domestic or wild. The few specimens obtained by us were taken only after a great amount of hunting, and by offering large rewards to native hunters.

About 3:00 p. m. on April 4, 1948, 13 kilometers east-southeast of Jesús Carranza, a large female containing a nearly full-term embryo was taken on a small island in the river (Río Coatzacoalcos). From the canoe we saw her walking along the sandy beach but before we could get within gunshot range she dived into the river and vanished. She crossed an arm of the river, reappeared, walked along the sandy beach, and waded to the bank where she was shot.

On the night of May 18, 1949, a small male paca was shot at a place 30 kilometers south-southeast of Jesús Carranza. The night was dark, and the full moon had not yet come over the horizon. We were hunting from a dugout, when the canoe passed the mouth of a small arroyo. The delta of the arroyo made a small, flat, marshy place at the edge of the river (Río Solosuchi). In the beam of the hunting light, a single large, dull red eye was seen. The color of the eye resembled that of a large rabbit, *Sylvilagus*, which also often shows only a single eye in a beam of light. The eye was far too dull for that of a pauraque, the common large goatsucker. Our shot brought down the paca. It had been feeding on the tender, succulent vegetation on the muddy bank of the arroyo.

On many occasions our dogs ran pacas, but usually lost the trails when the animals entered water. On April 1, 1949, 25 kilometers southeast of Jesús Carranza, our dogs startled a paca in a patch of thorny bushes about 10:00 a. m. The paca burst out of the thorns, dashed down the slope, and entered a small almost vertical burrow. Its entrance was about 30 feet from the bank of a small arroyo in which there was a pool of semi-stagnant water about 20 feet long and six feet wide. The bank beside the pool was about four feet high, and of dark, solid earth. Just above the water a horizontal burrow in the bank was in line with the vertical hole about 30 feet away on the floor of the jungle above. We built a fire at the lower entrance, forcing smoke into the burrow, and a few moments later a small paca emerged from the lower entrance and was shot.

Several days later another paca was driven to ground in a burrow beside this same arroyo. This paca dashed through a pool of water and entered a burrow in the vertical side of a bank about six feet high. About 40 feet back from the arroyo we found a smaller, vertical burrow, but were unable to force smoke from one entrance to the other; perhaps the two were not connected. We excavated the burrow near the water. The burrow coursed upward at a 30 degree angle from the water for a distance of two feet and then leveled off for a distance of some 20 feet. At this point the burrow pitched down again at a 30 degree angle and we ceased digging. Indeed, we never did succeed in completely excavating any burrow of a paca. Many hours were spent working with machetes, but little was accomplished except the removal of many cubic yards of earth. All the burrows excavated were simple tubes, but their principal extent lay at a distance of six feet or more beneath the surface of the ground. One other paca was caused to flee its burrow because of smoke of dry palm fronds, liberally mixed with powdered sulfur. At least ten other burrows were filled with smoke without success.

All of our pacas were in good condition. No parasites of any kind were noted on them. Most of them were taken in an area where the agouti, *Dasyprocta*, was numerous. Almost every agouti that we obtained had some parasitic fly larvae under the skin. These were never seen on pacas.

### *Dasyprocta mexicana* Saussure

#### Mexican Agouti

*Specimens examined.*—Total 46: 3 km. N Paraje Nuevo, 1700 ft., 3; 2 km. N Paraje Nuevo, 1700 ft., 1; 2 km. S Paraje Nuevo, 1; Buena Vista, 6 (U. S. N. M.); Catemaco, 3 (U. S. N. M.); Achotal, 8 (Chicago N. H. Mus.); 20 km. ENE Jesús Carranza, 200 ft., 7; 20 km. E Jesús Carranza, 300 ft., 2; 25 km. SE Jesús Carranza, 400 ft., 4; 35 km. SE Jesús Carranza, 400 ft., 4; 38 km. SE Jesús Carranza, 400 ft., 1; 30 km. SSE Jesús Carranza, 300 ft., 4; 60 km. SE Jesús Carranza, 450 ft., 2.

We are not able to find any difference between the agoutis of the upper humid division of the Tropical Life-zone of central Veracruz and the agoutis of the deep jungles of southern Veracruz.

Agoutis from the Isthmus area of Veracruz are the black *mexicana*. There is no evidence of intergradation between them and the brown agoutis of the *punctata* type, to the east in Campeche, or to the southwest in Chiapas. Because the ranges of the two kinds (*mexicana* and *punctata*) seem to be mutually exclusive, one would expect the two to intergrade. If they do intergrade, the area of intergradation must be much smaller than one would expect.

The agouti is called "Cerreti" over most of Veracruz, though locally the name "cuacechi" is used. Although much hunted, this species has not been so greatly reduced in numbers as the paca.

In some places agoutis hold their own, even near villages. They become very shy, will run for long distances when chased by dogs, and will take refuge in holes only as a last resort.

Near our base on the Río Coatzacoalcos, 20 kilometers east of Jesús Carranza, our pack of dogs chased agoutis almost daily, but only in a few instances were we able to capture the animals. Often the chase would continue for more than an hour. On the other hand, in the uninhabited country a short distance to the south, agoutis were abundant and the dogs usually brought them to bay after a relatively short chase, usually lasting about 15 minutes.

Near Potrero, where the agoutis are much hunted for food, they are crepuscular, and perhaps even partially nocturnal. They live in the cool, damp forest among the limestone boulders and make narrow trails to their feeding places. Our specimens from central Veracruz were all taken by a skillful Indian hunter, who set out small bunches of ripe bananas and visited them in early morning and late evening. In southern Veracruz, the agouti is entirely diurnal. We found it most active in the late morning and afternoon, less active in early morning and late evening, and never found any evidence of activity at night. Usually an agouti, at the approach of danger, stands motionless until the danger is past, and then dashes rapidly for the nearest shelter in a hollow log or burrow in the ground. When an agouti runs, a fan of long hair stands out around the animal's rump, somewhat reminiscent of the fan of the northern porcupine (*Erethizon*). The dash of an agouti for safety is rapid and erratic. It zigs and zags, without swerving greatly from its line of escape. Rarely do the feet come down twice in the same line. The animal makes a noise that is loud, out of all proportion to the agouti's size, as it rushes through the dead leaves and brush.

Some accounts of typical agouti hunts on the Río Chalchijapa and the Río Solosuchi, southeast of Jesús Carranza, are as follows:

March 27, 1948: Today the dogs ran several animals—probably all agoutis. Only one was caught. It took refuge in its burrow under a log and parallel to it. The burrow was a straight tube about 15 feet long, five inches in diameter, and a foot beneath the surface. Both ends opened out from under the log. The country was generally open, beneath tall, jungle trees, with some brush and many dead fallen leaves and twigs.

March 29: Today after a short chase, the dogs cornered an agouti in its burrow that was about 10 feet long, nine inches in diameter, and 30 inches beneath the surface. It had a single opening. The animal is a large male.

April 24: Today, after a short chase of about 15 minutes, the dogs brought a small agouti to bay in a hole in the ground at the base of a tall tree. The hole was large enough for one dog to enter, and it killed the agouti at the end of the burrow, about five feet from the mouth. Twice, now, we have taken very small specimens in very large holes. Larger animals seem to have smaller burrows than younger animals.

April 30: We found abundant agouti sign here a week ago, and so returned in order to obtain a series of specimens. The dogs worked well, running about 12 animals. Of these we got five; one was a skunk and four were agoutis. Most of the other animals were probably agoutis—three or four certainly were. The four obtained all took refuge in hollow logs. These hollows, in every case, were just large enough to admit the agoutis. If we were able to, we opened the logs with a machete. Some logs of very hard wood could not be opened. On these logs we used smoke of burning sulfur. Even this did not budge some animals, and we had to leave them. Of the four taken, one is a male with large testes; two are nursing females; and one is a female containing two full-term embryos. All have two to six fly warbles, usually on the backs or shoulders.

May 1: A large female was taken today after a long chase that lasted nearly an hour. As usual, the animal entered a hollow log and was chopped out.

About 4:00 p. m. a large male agouti ran along the edge of the river at the base of a sand bluff. It must have been hiding behind a clump of earth, for it was not seen until it dashed away with the erected "fan" of hairs. It did not try to enter the water. I shot it with the rifle. It was heavily infested with fly warbles. One area three inches in diameter on its shoulders was a solid mass of warbles and had to be cut out of the skin. Two or three black fleas were also present.

Twice we found remains of agoutis in stomachs of ocelots.

#### Order CARNIVORA

#### Family Canidae

#### *Canis latrans cagottis* (Hamilton-Smith)

#### Coyote

*Specimens examined.*—Total 2: 15 km. W Piedras Negras, 300 ft., 1; Río Blanco, 20 km. W Piedras Negras, 400 ft., 1.

This animal is known throughout Veracruz by its Spanish name, coyote, derived from the Nahuatl "coyotl". The coyote lives on the



arid coastal plain and is said to occur as far west, along the coast, as the sugar cane fields near Potrero. In northern Veracruz it occurs principally along the sea beaches, moving inland wherever there are clearings. The coyote occurs also on the Perote Desert and in the pine forests of the mountains of the west-central part of the state. It avoids the dense jungle completely.

We saw no coyotes in the daytime, but often heard them howling at night on the coastal plain, and on the desert near Limón. Tracks were seen on the dust of trails. Coyotes avoided our traps, however, as did most carnivores in Veracruz. One of our specimens was shot at night when it attempted to steal a chicken. When it was skinned, an old pellet of buckshot was found lodged in one front foot. The second specimen was shot in an arroyo at night, with the aid of a hunting light.

The habits of the coyote in Veracruz seem to be much like those of the species in the United States. The coyote is universally accused of stealing chickens, although we never heard of one killing larger domestic animals on the coastal plain. Such animals as horses, burros, cattle, pigs, sheep and goats are raised in numbers on the coastal plain. Coyotes are said to feed on carrion whenever the opportunity offers.

Our specimens were in good pelage but had a large number of ticks—small to large, reddish, and present over the entire body, but especially on the ears.

### **Urocyon cinereoargenteus**

#### **Gray Fox**

The gray fox is called *zorra* in Veracruz. In southern Veracruz, where there are no foxes, the opossum (*Didelphis*) is called *zorro*.

In Veracruz, foxes live in open country, including clearings in the jungle, from sea level at least to 8000 feet elevation, and they were reported from the Cofre de Perote at 10,500 feet elevation. They are probably most common in the lower arid division of the Tropical Life-zone of the coastal plain, but are also fairly common in the upper humid division forest and in the pine forests of high elevation. Only in the dense jungles of the lower humid division of the Tropical Life-zone do they seem to be absent.

Probably these foxes are principally nocturnal. We shot two at night, in the beams of hunting lights, and trapped another at night. To a certain extent, however, they are diurnal, for we saw several out at midday. One was hunting on an exceptionally hot, bright, sunlit day.

Foxes were accused of stealing chickens, and probably do so. We examined fox droppings near Las Vigas, 8000 feet elevation, and found them to contain only vegetable matter, except for one that held the remains of a mouse, *Peromyscus melanotis*. Most common, in droppings collected in early November, was a small, purple berry that grows in spikes, only a few inches high. One dropping was composed entirely of corn. Another was principally of the purple berry, but held also a single large blackish bean. At that locality, a pocket gopher, *Cratogeomys perotensis*, was eaten in the trap by a fox.

The only parasites noted on gray foxes were on specimens from the tropics. These all had the common large tick, locally called garrapata. Foxes are shot whenever opportunity arises, in Veracruz, and when killed are sometimes eaten by man. They are rarely hunted, however, and the steel trap is almost unknown to the natives. Consequently the gray fox exists throughout its range in fair numbers.

#### *Urocyon cinereoargenteus orinomus* Goldman

*Specimens examined*.—Total 11: Las Vigas, 1 (U. S. N. M.); 3 km. E Las Vigas, 8000 ft., 1; Jalapa, 1 (U. S. N. M.); 7 km. NW Potrero, 1700 ft., 1; Potrero, 1700 ft., 1; Orizaba, 3 (U. S. N. M.); 15 km. W Piedras Negras, 300 ft., 1; Río Blanco, 20 km. WNW Piedras Negras, 1; 24 km. E, 7 km. S Jesús Carranza, 1.

#### *Urocyon cinereoargenteus scottii* Mearns

*Specimen examined*.—One from 3 km. W Zacualpan, 6000 ft.

#### Family Procyonidae

#### *Bassariscus astutus astutus* (Lichtenstein)

#### Ringtail

*Specimens examined*.—Total 8: Acatlán, 4100 ft., 1; Las Vigas, 8500 ft., 1; 1 km. W Las Vigas, 8500 ft., 1; 2 km. E Las Vigas, 8000 ft., 1; 2 km. W Jico, 4200 ft., 1; Maltrata, 1 (U. S. N. M.); Orizaba, 2 (U. S. N. M.).

Additional record.—Xico (Sanborn, 1947:270).

In Veracruz the ringtail occurs in the uplands, principally on the Mexican Plateau. Where conditions are suitable it descends to the upper edge of the upper humid division of the Tropical Life-zone. Our lowest record altitudinally is 4200 feet, at Jico. Zonally the species ranges from the upper edge of the Tropical Life-zone, through the pine forests near Las Vigas, and onto the desert near Perote. The ringtail is rather restricted as to habitat. It is specialized for life in rocky places, such as cliffs, outcrops and lava flows. This seems to be true, to a greater or lesser degree, over the entire range of the species.

Two ringtails were seen on top of a rocky cliff two kilometers west of Jico on October 30, 1946. This area is tropical forest, with the pines of the next higher life-zone beginning to appear as outliers. The animals were found about 10 p. m., along a rocky ledge near the cliff, when the beam of my headlight picked up two pairs of eyes. They had an unusually bright shine—one pure yellow and the other yellow tinged with orange. I fired a charge of buckshot between them. When I climbed up to the ledge, I found nothing but heard a loud chirping, rather birdlike. I saw an animal back in the brush, at a range of about four feet, but it slipped over the cliff. I assumed that it was wounded. We called the dog from camp, and he found one ringtail. This one was well shot—not the one I saw first. We searched in vain for an hour for the other and got well scratched with *malamujer*. The specimen found was a male. It had a strong skunklike odor. Its stomach was full of mice—seemingly of the species *Peromyscus furvus* that was abundant there. Three of the large ticks, locally known as *garrapatas*, were on the animal. No other parasites were seen. Its testes were rather small.

On the night of October 5, 1948, along the edge of the fresh lava flow two kilometers east of Las Vigas we were searching for wood rats wherever holes opened in the dense, drifting fog. A pair of greenish yellow eyes were seen; the animal was running swiftly over the rough lava. A whistle did not cause the animal to stop. A shot brought down an old female ringtail that was nursing young. Her stomach was filled with the fruit of the prickly pear cactus (locally called *tuna de nopal*). We saw no plants of this cactus in our wanderings near Las Vigas. The specimen had no ectoparasites.

On October 14, 1948, a full grown young ringtail was captured in a house in Las Vigas. The animal had entered in the night, and created a disturbance in trying to find a way out. The ringtail was kept alive for a short time. It had a harsh, menacing growl and a shrill, chattering squeal. It was an agile climber on the walls of the house.

### *Bassariscus sumichrasti sumichrasti* (Saussure)

#### Tropical Cacomixtle

*Specimens examined* (U. S. N. M.).—Total 3: Jalapa, 2 (1 a skull only); Mirador, 1.

This species is the jungle equivalent of the ringtail, specialized for an arboreal life, rather than life in rocky places. We failed to take specimens in Veracruz.

**Procyon lotor**

## Raccoon

In central and extreme southern Veracruz the raccoon is called "mapache." In the Tuxtla Mountains area it is called "mapachina." Both of these words are corruptions, probably Totonac and Zapotec, of the Nahuatlan word, "mapachtli," which is still used occasionally in that part of Veracruz on the edge of the Mexican Plateau.

Zonally the raccoon ranges throughout the Tropical Life-zone, from the upper edge of the upper humid division to the lowest part of the lower humid and lower arid division. Altitudinally we have records from 4200 feet to sea level. In Veracruz the species is less restricted to the vicinity of water than it is in the United States. Many of our specimens were captured several miles from water. As elsewhere in Mexico and North America, tracks are seen in the early morning, in the mud and sand along the edges of streams, ponds, and rivers. In the day, raccoons find refuge in hollows of trees, and later, when the tropical sun makes their hollows too warm, they emerge and rest on the limbs of tall, vine-laden trees, where the raccoons are invisible from the ground, but able to catch any cooling breeze. Local people are aware of this habit and when the sun is hottest visit the arroyos having vine-laden trees, which they patiently climb in search of the animals. Two of our specimens were obtained in this way.

One was taken on the south side of the Río Blanco, 20 kilometers west-northwest of Piedras Negras, on May 14, 1946. This area is on the arid coastal plain, and we went hunting for raccoons in the extreme heat of midday. We had gone some distance up the arroyo, examining each vine-hung tree carefully, without seeing even a squirrel. When we reached an especially tall, densely vine-hung tree, we looked for some time. Finally Vicente said that it was a perfect animal tree, and he was going to climb it. After some hard work he got up about 50 feet, and called that he saw a porcupine. Then he said no, it was a raccoon. We forgot our heat exhaustion, and even the dogs caught some of our excitement, for they gathered around the foot of the tree expectantly. Vicente climbed higher, growling menacingly and shaking vines. After several minutes the raccoon came plunging down through the vines and branches. Two weeks later at the same locality another raccoon was taken under similar circumstances.

Four kilometers west of Tlapacoyan on November 24, 1947, while hunting with several of the local people, we for a long time found nothing, until the dogs barked at the base of a large, hollow tree.

We heard animals in the tree, and built a fire and smoked out an old female raccoon and three young. The tree was in dense jungle near a small arroyo. I think it was an oak.

Twenty kilometers east of Jesús Carranza on February 8, 1948, the dogs treed something in a tree in the low, palm jungle. When we came up we found six raccoons in the tree, a low, bushy species about 50 feet high. We got all six animals. Two were large females, not pregnant. The others, one female and three males, were smaller, not fully adult animals. No ectoparasites were noted.

The raccoon is much hunted for food in Veracruz, although it is not considered as first-class meat. Even old animals, when properly prepared, are tender and well flavored. The chili and other spices used in cooking seem to kill any strong taste that might be present.

### *Procyon lotor hernandezii* Wagler

*Specimens examined*.—Total 15: 4 km. W Tlapacoyan, 1700 ft., 2; Río Blanco, 20 km. WNW Piedras Negras, 300 ft., 2; Jico, 3 (U. S. N. M.); 20 km. ENE Jesús Carranza, 200 ft., 1; 20 km. E Jesús Carranza, 300 ft., 7.

Additional record.—Mirador (Goldman, 1950:65).

Taxonomic appraisal of specimens was summarized in 1948 in manuscript by Dalquest as follows: "Comparison of the skulls of raccoons from Veracruz with skulls from Campeche and from the Mexican Plateau, shows that our material most closely resembles those from the plateau. The skulls of our specimens are smaller, and narrower in the interorbital region, as compared with *shufeldti* from Campeche, and thus resemble *hernandezii*. The skins are more or less intermediate between those of the two subspecies, but more nearly like those of *hernandezii*. The fur is longer than in *shufeldti* but slightly shorter and thinner than in *hernandezii*. In color, all but three of our skins resemble *hernandezii*. Veracruzian raccoons are distinctly intermediate between the two subspecies, and show no characters worthy of separate recognition. In Veracruz, material from the high, cool tropics and the low, hot jungles, is essentially the same."

### *Procyon lotor shufeldti* Nelson and Goldman

Record.—Minatitlán (Goldman, 1950:67).

### *Nasua narica*

#### Coati

The coatimundi is termed "tejón" throughout Veracruz. The geographic range includes the Tropical Life-zone of the State, although the species is rare at high elevations and absent from the arid coastal plain. The coatimundi, or coati, seems to be entirely diurnal. We found all of our animals in the daytime, and never found the species at night.



The coati was most commonly found in low, brushy jungle and palm jungle, and rarely in deep forest. The jungle of coyol palm was especially favored; this palm furnishes shelter, shade, and a fruit of which the animal is especially fond. The coati likes also boulder-strewn areas, cliffs, and the dense tangles of low vegetation that fringe the water courses.

In Veracruz, as elsewhere in México, the natives maintain that there are two species of the coati. In Veracruz "tejón" and "tejón solo" are the names used. The "tejónes" travel in bands, whereas the "tejónes solos" are solitary. We took five "tejónes solos." Three of these were females and two were males. They were all adult animals, and rather old. But, our oldest and largest coati was with a band of other animals and was not a "tejón solo." In general the coati is a social animal. Bands vary greatly in size. Some bands include only three to 10 animals. Rarely a band numbers 50 or more. Bands of 100 were reported.

The coati spends much of its time on the ground. The bands usually travel rather slowly, and spread out when hunting, but the individuals proceed in single file when traveling. They keep the long tail upright, with the extreme tip bent backwards, almost horizontally. When hunting food on the forest floor they make considerable noise, scratching, rustling leaves and branches. They do a great deal of piglike rooting in the leaves and ground. When a band of coatis has passed, the characteristic signs are numerous scratched and rooted places in the leaves.

The food of the coati consists principally of vegetable matter. One favored food is the fruit of the coyol palm. This is a nut about two inches in length and an inch wide. It has a tough rind, and a thin layer of pulp over a rock-hard seed. The nuts grow in great, pendant clumps, weighing many pounds. All trees do not come into fruit at the same time; the season lasts from early March into June. The seeds beneath a coyol palm often show the tooth marks of the coati, where the oily pulp has been chewed away, leaving the tough fibers attached to the seed.

Corn is also eaten, and coatis occasionally do a great deal of damage to milpas. Bananas are eaten, even before they are ripe.

The coati is much hunted for food in Veracruz. Dogs are trained to tree the animal, which local people consider more of a squirrel than a carnivore. The flesh of the older animals is sometimes tough and rank, but that of younger animals is tender and of good flavor. One female taken on March 15, contained four embryos. One old animal had lost the terminal part of its tail. Parasites are uncommon

on coatis. Most of the specimens examined by us had a few ticks and one old male had a heavy infestation of fly larvae. There were more than 50 larvae, some even on the feet, tail and jaws.

### *Nasua narica molaris* Merriam

*Specimen examined*.—Hacienda Tamiahua, Cabo Rojo, 1.

### *Nasua narica narica* (Linnaeus)

*Specimens examined*.—Total 35: Jico, 1 (U. S. N. M.); Carrizal, 1 (U. S. N. M.); 7 km. NW Potrero, 1; 3 km. N Paraje Nuevo, 1700 ft., 1; 2 km. N Paraje Nuevo, 1700 ft., 1; 2 km. E Paraje Nuevo, 1700 ft., 3; Potrero Viejo, 1700 ft., 5; Orizaba, 1 (U. S. N. M.); 14 km. SW Coatzacoalcos, 100 ft., 1; 35 km. ENE Jesús Carranza, 150 ft., 7; 20 km. ENE Jesús Carranza, 300 ft., 1; 20 km. E Jesús Carranza, 300 ft., 11; 35 km. SE Jesús Carranza, 400 ft., 1.

Additional records.—Pasa Nueva (Allen, J. A., 1904:39); Jalapa (Allen, J. A., 1879:165).

### *Potos flavus aztecus* Thomas

#### Kinkajou

*Specimens examined*.—Total 31: 12½ mi. N Tihuatlán, 300 ft., 2; 7 km. SE San Juan de la Punta, 400 ft., 1; 3 km. N Presidio, 1500 ft., 1; Río Blanco, 20 km. WNW Piedras Negras, 1; Coatzacoalcos (Region), 4; 3 km. E San Andrés Tuxtla, 1000 ft., 1; 20 km. E Jesús Carranza, 300 ft., 7; 25 km. SE Jesús Carranza, 250 ft., 7; 35 km. SE Jesús Carranza, 1; 38 km. SE Jesús Carranza, 500 ft., 1; Arroyo Saoso, 37 km. E, 7 km. S Jesús Carranza, 3; 30 km. SSE Jesús Carranza, 300 ft., 1; 55 km. ESE Jesús Carranza, 450 ft., 1.

Additional record.—Jalapa (Ferrari-Pérez, 1886:128).

A single adult female kinkajou is available from the Tuxtla Mountains of Veracruz and differs from all other kinkajous examined from México, especially in large size and large skull. This single specimen is here regarded as an extreme variant of *P. f. aztecus*, but if additional material from the same area resembles our specimen, the kinkajou from the Tuxtla Mountains will require a new name.

The kinkajou is generally known as "marta" in Veracruz. Locally the name "martucha" may be used, and in northern Veracruz we heard it called "mico de noche." In southern Veracruz, "mico de noche" is the native name for the two-toed anteater.

The kinkajou is arboreal. Probably it descends to the ground. It prefers the tall trees of the deep jungle, but visits lower growth and riverside forest in search of fruits, and may live permanently in some place of that kind. We found kinkajous most common where trees were more than 150 feet in height. Rarely did we find them in palm jungle.

Kinkajous are nocturnal, but, like some other nocturnal and arboreal animals, emerge from their retreats at midday to take advantage of cooling breezes. Probably the hollows in which they

live become unbearably hot in the strong tropical sun. Because daytime encounters with this species are unusual they are recounted here.

On the south side of the Río Blanco, 20 kilometers west-northwest Piedras Negras, 300 feet elevation, on May 15, 1946, while hunting with two companions about midday in a forest-fringed arroyo, we found several partly eaten fruits under one large tree. I picked up one and found the unmistakable tooth marks of a large fruit bat. Vicente walked ahead and picked up several which he looked at and remarked "this is not bat." He called to Gerardo, that there was an animal in the tree. Gerardo peered about a moment and then shouted "Yes, a martucha." The animal was out of our sight about 40 feet up in the vine-hung tree. Gerardo fired twice and it descended and ran along a horizontal limb about 40 feet from me and 20 feet from the opposite bank of the arroyo. It was running smoothly but rather slowly. I fired and hit it in the chest with a load of number five shot. It started to fall, then caught its tail around a branch and hung for a moment. It released its hold and crashed into the brush at the very lip of the arroyo.

Twenty kilometers west of Piedras Negras, on October 2, 1946, Mr. Allen Oleson found two kinkajous clinging together in a ball, nearly in the top of a tree, about 50 feet from the ground. He fired at them with his pistol and secured the larger, an adult female. The smaller escaped, making a mewling cry. The smaller was presumably the young of the larger, but the mammae of the larger animal were not active.

Twenty kilometers east of Jesús Carranza, early in the morning of March 21, 1948, a male kinkajou was found in a tree in low palm jungle. The day was very hot. The animal was probably driven from its hollow by the heat. It was in a tree of moderate size—about two feet in diameter at the base. The kinkajou lay on one limb immediately above a fork about 20 feet from the ground. Its head was up as it alertly watched us.

Most of our specimens of kinkajou were obtained at night. In the beam of a headlight, the kinkajou's eyes reflect a bright yellow glow. The kinkajou also makes a call that is distinctive and that, once heard, is not forgotten. Kinkajous call often, and a calling animal can usually be located. The loud, plaintive, somewhat quavering scream is made by both males and females.

On one or two occasions we thought that more than one kinkajou was in a tree, but never did we actually see more than one. In

most instances the animals were almost certainly solitary. Even when locally abundant, they seem to remain 100 yards or more apart. They make considerable noise in their movements aloft, and there is often a shower of leaves, twigs and fruit falling beneath a tree where a kinkajou is feeding.

Kinkajous feed where fruit is found. We took one specimen only 20 feet from the ground, in a mass of vines and creepers. Others were fully 100 feet from the ground. Probably about 60 feet is the elevation at which they usually live. They prefer large limbs, and may carry fruit there to eat it. We have seen them well out on slender limbs, however. Twice, individuals were seen hanging by their tails and swinging in wide arcs.

When kinkajous find a tree having an abundance of fruit, they return to the same tree, night after night. We hunted one kinkajou in a patch of jungle for several successive nights, even shooting at it on some occasions. It remained at a height of about 100 feet. Although it became more shy, it returned each night to the fruit tree, until it was shot.

The food of the kinkajou seems to be entirely fruit. In addition to the mango, it eats: a tough-skinned green fruit; a green berry resembling the blue elderberry in size, shape and general appearance; a nutlike fruit; the fruit of the amata fig; and a round vine fruit, about three inches in diameter, having a hard rind and a pale pink pulp that looked like a melon and had a delicious odor.

Some kinkajous were shot over water. In every case the animal fell into the water and sank like a stone, not floating for even a moment. The body of the kinkajou is astonishingly heavy for its volume.

No parasites of any kind were found by us on the kinkajou. The animal has a rather strong, musky odor. The flesh is lean and rather rank. The kinkajou is not eaten in most parts of Veracruz, but one man requested the meat of a kinkajou that we shot. His companions made fun of him, but he maintained that it was choice food. One dead kinkajou was found on the bank of a river. It had no wounds of any kind, but was too decayed to dissect. The skull of this animal was saved.

A female taken on December 1 had a small embryo, five millimeters long, in the right horn of the uterus. Another had two nearly full-term embryos on January 20. In this species there are two mammae, in an area free of fur, well forward on the inguinal region.

## Family Mustelidae

*Mustela frenata*

## Long-tailed Weasel

The long-tailed weasel is called "oncilla" in Veracruz. It occurs from the Tropical Life-zone to the Canadian Life-zone, from 300 to 12,500 feet in elevation. It is rare, occurring locally where mice are abundant—about cliffs, in old rock walls, in brushy places, and in sugar cane fields. It is principally, if not entirely, diurnal. Several were seen in the daytime in Veracruz, and one at night.

Two specimens taken two kilometers west of Jico, were killed along a rocky, boulder-strewn coffee grove at the foot of a cliff. Their stomachs were crammed with the remains of deer mice (*Peromyscus furvus*).

Testes were moderately large, but probably not in breeding condition, on October 30. Specimens from seven kilometers west of Potrero were shot in sugar cane fields by local hunters and saved for us. The specimen from Las Vigas was taken in a trap set for a ringtail beside a lava flow.

Several weasels had ticks in the ears, but no other parasites were noted.

*Mustela frenata macrophonus* (Elliot)

*Specimens examined*.—Total 3: Achotal, 1 (Chicago N. H. Mus., type); Pérez, 2 (U. S. N. M.).

*Mustela frenata perda* (Merriam)

*Specimens examined*.—Total 2: Catemaco, 1 (U. S. N. M.); 35 km. SE Jesús Carranza, 400 ft., 1.

*Mustela frenata perotae* Hall

*Specimen examined*.—Cofre de Perote, 1 (U. S. N. M.).

Additional record.—Perote (Hall, 1951:355).

*Mustela frenata tropicalis* (Merriam)

*Specimens examined*.—Total 6: Hacienda Tamiahua, Cabo Rojo, 1; 2 km. W Jico, 4200 ft., 2; Las Vigas, 8500 ft., 1; 2 km. W Potrero, 1700 ft., 1; 3 km. N Paraje Nuevo, 1700 ft., 1.

Additional records.—Jico (Merriam, 1896:30); 5 km. N Jalapa, 4500 ft. (Davis, 1944:381); Jalapa (Hall, 1951:366); Orizaba (Hall, 1951:366).

The specimen from Las Vigas has some characteristics of *M. f. frenata*, which suggest intergradation between *frenata* and *tropicalis* in the highlands of Veracruz.



*Eira barbara senex* (Thomas)

## Tayra

*Specimens examined*.—Total 8: Mirador, 1 (U. S. N. M.); Catemaco, 1 (U. S. N. M.); Pérez, 1 (U. S. N. M.); 20 km. ENE Jesús Carranza, 200 ft., 3; 20 km. E Jesús Carranza, 300 ft., 1; 38 km. SE Jesús Carranza, 500 ft., 1.

*Additional records*.—Hacienda Tortugas (Thomas, 1900:146); Pasa Nueva (Allen 1904:36).

The tayra is known throughout Veracruz as "cabeza de viejo," literally, head of old in reference to the white or gray head. It is well known to the natives, but we found it difficult to obtain specimens.

The tayra seems to be normally a forest animal. We heard no reports of its occurrence on the coastal plain, unless the type locality is there. As we observed it, it is diurnal. Several times, however, we heard a cry at night that we were told by natives was made by a tayra. This cry may or may not have been made by a tayra. Tayras are not social to any extent. We were told that four or five sometimes go together to raid sugar cane patches and cornfields. Perhaps these are family groups. On April 9, 1948, we saw two animals together in a fig tree overhanging a small arroyo 38 kilometers southeast of Jesús Carranza, when we were poling a canoe upstream. By the time we had got the canoe ashore, they had vanished. We spread out; I went up the arroyo. A few minutes later Chico shot. Then a tayra came running along a log that bridges the arroyo. It was wounded. I shot, but it kept on going. A minute later the dogs came along its trail and crossed the log. About 100 feet away they brought it to bay at the foot of a large tree. Though it was much wounded it was very vicious. It was very quick. When I tried to step on its chest, it bit my foot. When Casculo tried, it tore a long strip from his shoe, ruining it. The dogs and I finally killed it. It was an adult but non-pregnant female. It had very little of the musk odor of the weasel, but had a faint, unpleasant smell.

The natives accuse the tayra of destroying corn. One of our specimens was shot while tearing down cornstalks in a field. It is also accused of destroying sugar cane. We saw sugar cane patches that had been almost completely ruined by some animal. The stalks had been ripped, torn and chewed, and it seemed to be the work of a flesh-eating mammal, to judge from the tooth marks. Sugar cane seems to be an unusual diet for a mustelid. These stories of destruction of cane by the tayra are so widespread that

there seems to be no reasonable doubt that the tayra is responsible. Probably fruit, birds and small mammals are the more usual diet of the tayra. One of our native helpers said he had seen tayras chasing squirrels.

### *Galictis allamandi canaster* Nelson

#### Grisón

*Specimens examined*.—Total 2: Potrero Viejo, 1700 ft., 1; 20 km. ENE Jesús Carranza, 200 ft., 1.

Additional record.—Orizaba (Goodwin, 1953:435).

The grison is one of the rarest carnivores that occurs in Veracruz. One of our specimens was shot by a native hunter in a sugar cane field at Potrero Viejo. He recognized the animal as unusual, and brought it to Mr. Dyfrig Forbes, who had it stuffed for us. The other specimen is a skull-only that was among several dry skulls saved for us by people on the Río Coatzacoalcos, east of Jesús Carranza. This particular lot included skulls of tamandua, agouti, armadillo, opossum, tayra, and coati. The hunter knew that we were anxious to obtain skulls of the tayra, and sold the grison skull to us as a tayra skull. Not until the skull was cleaned in the laboratory was it identified as from a grison.

### *Mephitis macroura*

#### Hooded Skunk

“Zorrillo” is the vernacular name used for this species and for the hog-nosed skunk throughout Veracruz. The hooded skunk inhabits open areas. We have no evidence of its presence in the jungle. The species is found in the arid pine forest and open desert in the west-central part of the state, and on the arid coastal plain to the east. Howell (1901:42) records a specimen from Orizaba, but the specimen may have come from the highlands to the west, or even from the mountains of that name, rather than from the city.

Seemingly hooded skunks are entirely nocturnal. We caught none in traps. On one occasion a skunk was seen at night in a clump of thorny plants, and the area was surrounded with steel traps, baited with meat. The skunk did not visit the traps. Other meat-baited traps, set where skunks were common, took no skunks. We collected the needed specimens by hunting them at night with headlights. Their eyes have a greenish glow, as seen in the reflected light.

Hooded skunks from the coastal plain had relatively little skunk odor, far less than a striped skunk of equal size from the United

States. Skunks from the highlands, near Las Vigas, however, had the usual strong skunk odor.

In the pine forest area, we found hooded skunks along rock walls, along cercas of maguey, and along the edge of an extensive lava flow. Usually they were in relatively open country, rather than in the pine forest. On the coastal plain they were found in brush, in tall sawgrass meadows, and along fence lines of thorny, yucca-like plants. Near Las Vigas, the skunks were eating grasshoppers and a small purple berry. On the coastal plain, one was found feeding on mangos that had fallen to the ground, and two were feeding on grasshoppers in a recently plowed field.

One old male hooded skunk had enlarged testes on January 13, but none of our other specimens showed evidence of breeding. At Las Vigas two young, three-quarters grown, specimens were taken in mid-October.

### *Mephitis macroura eximius* Hall and Dalquest

*Specimens examined*.—Total 3: Río Blanco, 20 km. WNW Piedras Negras, 2; 15 km. W Piedras Negras, 1.

### *Mephitis macroura macroura* Lichtenstein

*Specimens examined*.—Total 11: Perote, 1 (U. S. N. M.); Las Vigas, 8500 ft., 6 (2 in U. S. N. M.); Jico, 4 (U. S. N. M.).

Additional record.—Orizaba (Hall and Dalquest, 1950:578).

### *Conepatus leuconotus leuconotus* (Lichtenstein)

#### Eastern Hog-nosed Skunk

*Specimens examined*.—Total 3: Potrero Llano [= Potrero del Llano], 350 ft., 1; Río Blanco, 20 km. WNW Piedras Negras, 300 ft., 2.

Additional records.—Near Martínez de la Torre (N of Perote) (Ingles, 1959:405); Río Alvarado (now known as Río Papaloapan), type locality.

The specimen from northern Veracruz has the color pattern of *leuconotus* but is larger than *leuconotus*, with a larger skull, thus showing intergradation with *texensis*. Probably the range of this species is continuous along the gulf coast from Veracruz to Brownsville, Texas, and intergradation probably takes place gradually between the two subspecies.

The hog-nosed skunk is called "zorrillo" in Veracruz. Local residents recognize it as being a species different from the hooded skunk but used the same name for both so far as we could determine. The hog-nosed skunk and hooded skunk occur together on the coastal plain.

We found this species only at night. It seems to be rather rare in Veracruz. Our three specimens were all found in cornfields.

One of the fields was surrounded by low brushland and the other two by extensive grassy plains. On the plains, scattered thickets of bull-horn acacia and other thorny plants offered cover. The stomachs of all three specimens were filled with remains of insects. A female taken on May 24 was nursing young.

Individuals of this species emitted only a little musk when shot. Their musk glands were large and full, as full and large as the glands of a large *Mephitis* from the United States.

### *Conepatus semistriatus coneptatl* (Gmelin)

#### Striped Hog-nosed Skunk

*Specimens examined*.—Total 7: Motzorongo, 1 (U. S. N. M.); Catemaco, 2 (U. S. N. M.); Pérez, 1 (U. S. N. M.); 14 km. SW Coatzacoalcos, 100 ft., 1; 20 km. ENE Jesús Carranza, 200 ft., 1; 35 km. SE Jesús Carranza, 400 ft., 1.

Additional record.—Pasa Nueva (Allen, J. A., 1904:36).

This skunk, like the other skunks, is called "zorrillo," sometimes modified to "zorrillo que apesta mucho" or "zorrillo pijón." It is a jungle-inhabiting species and although widespread is rare. We hunted in vain for it at Motzorongo, the type locality. In southern Veracruz, we found it to be more common. One was shot there at night, 14 kilometers southwest of Coatzacoalcos, on February 12, 1947, at the base of an isolated tree where the shade of the tree and a few bushes beneath it allowed enough open ground in an extensive area of sawgrass for our lights to pick out the animal's eyes. They shine bright green.

The animal was an adult female, notably fat, and not pregnant. No parasites were noted on it. It had a strong odor, stronger than the odor of any other skunk obtained in Veracruz.

Thirty-five kilometers southeast of Jesús Carranza on April 30, 1948, shortly after dawn, we came upon a small opening in the forest where a year or so before a large tree had fallen smashing down others in its fall. The small opening had allowed the wind a longer reach, and other old, rotten trunks had fallen, all inwards. As a result there was a dense tangle of trunks, vines, bushes and grasses about 100 feet in diameter. This type of opening is fairly common in the jungle, and agoutis commonly live in such places. We were not surprised, therefore, when the dogs found an animal's trail. But, the trail, unlike that of an agouti, wound back and forth within the clearing before the dogs bayed at a hole that was under the branches of a windfall at almost the center of the clearing. The dogs had ruined the original entrance and we chopped our way in to the burrow. It was about six inches in diameter and five feet long. The skunk was found at the end, about a foot beneath the surface

of the ground. The animal had the usual skunk odor, but not very strong. It was a male with large testes. Several large black ticks were noted on it. It had no fly larvae, although almost every other mammal taken at this locality had several.

Twenty kilometers east-northeast of Jesús Carranza on April 12, 1949, an old male was brought to bay in a burrow in a patch of wild bananas, locally called platano tuno. This variety of banana grows in extensive clumps, but between the clumps the ground is open. The burrow was a simple tube about four feet long and 10 inches beneath the surface, with an entrance about six inches in diameter. There was no nest.

### *Lutra annectens annectens* Major

#### Southern River Otter

*Specimens examined.*—Total 4: 20 km. W Piedras Negras, 300 ft., 1; 20 km. ENE Jesús Carranza, 200 ft., 1; 35 km. SE Jesús Carranza, 400 ft., 1; 38 km. SE Jesús Carranza, 400 ft., 1.

*Additional records.*—Orizaba (Pohle, 1920:95); Papaloapan (Ingles, 1959:406). Río Jamapa, near Huatusco (Sumichrast, 1882:213); Río Blanco, near Omealca (*ibid.*).

The otter is called "perro de agua" in Veracruz. It is not common, and occurs in the lower, more sluggish parts of the larger rivers. Otters were reported from Puente Nacional, in the Río Antiguo, at 500 feet elevation. They rarely leave the rivers, although on one occasion, 14 kilometers southwest of Coatzacoalcos, 100 feet elevation, we were told that one had strayed into a small stream, no more than six feet across and fully one kilometer from the river. We hurried to the place, but the otter had left. The local people told us that the occurrence of an otter in that stream was not unheard of, but was unusual.

Otters in Veracruz are diurnal. They are most active in the gray light of the very early morning, but may be seen at almost any hour of the day. In literally hundreds of hours of night hunting from a canoe, we saw not a single pair of eyes that we thought were of an otter.

On the Río Blanco, near Piedras Negras, we found otters to be extremely shy, and we got only a few glimpses of the animals. Gerardo Mazza and his father came upon one large and one smaller otter in the Río Blanco on June 3, 1946. They shot the larger animal, which sank from sight. The water of the river was greatly discolored from a recent rainstorm in the mountains and, although both men rushed into the river, not waiting to remove their clothing, they were unable to recover the animal. Our only specimen from that locality was shot by a hunter and lacks the skull.



On April 8, 1948, 35 kilometers southeast of Jesús Carranza I was up on a limestone bluff, hunting bats, when a large male otter appeared in a deep hole in the river and dived before Chico could shoot. He saw it go into a cave, almost completely under the surface. The mouth of the cave was about 18 inches in diameter. Peering into a large crevice I saw the otter about 15 feet below and as it turned to go over a projecting rock I shot the otter in the chest with a load of buckshot. Chico recovered it by diving.

We examined many otter scats there. All consisted only of fish bones and scales. One head of a needle gar was seen; it may have been discarded by the otter or may have been part of a scat. The scats and piles of scales were mainly of *bobo*, *zoro* and *mojarra*. One large pile of the suckerlike *puespuerco* was seen. Two or three seemed to be *robalo*. No remains of other animals or small fish were seen.

The only parasite found on this otter was a large, black tick, unlike any tick that I ever saw before.

Field notes for April 30 mention that in the same general area we had seen several otter in the last few days, had lost one that was dead or wounded, and that on April 30 as we were coming through a wide pool of shallow water with a shallow rapid at each end, we obtained another. It was a male, much smaller than the other one, but with fine fur.

On April 10, 1949, 20 kilometers east-northeast of Jesús Carranza a native hunter shot an adult female containing four large embryos and saved for us the skin and perfect skull.

### Family Felidae

#### *Felis onca veraecrucis* Nelson and Goldman

#### Jaguar

*Specimens examined*.—Total 8: San Juan de los Reyes, 1 (U. S. N. M.); San Andrés Tuxtla, 1 (U. S. N. M., type); Pérez, 1 (U. S. N. M.); 20 km. ENE Jesús Carranza, 200 ft., 2; 20 km. E Jesús Carranza, 300 ft., 3.

*Additional records*.—"Norte de Veracruz" (Ingles, 1959:406); Orizaba (Nelson and Goldman, 1933:237); Achotal (Elliot, 1907:38).

The jaguar is known as "tigre" or "tigre real," in Veracruz. The term tigre is used in a rather general sense, however, and may refer to any of the cats.

The jaguar is much hunted in Veracruz. It has been almost extirpated in the heavily populated central part of the state. In the tick-infested, thorny brushlands of northern Veracruz, especially near the gulf, we were told that the jaguar was fairly common. We

saw no signs of jaguars there, however, nor were skins offered for sale. In the south it is common, and in the uninhabited area south of the isthmus, it is about as abundant as the game supply will allow.

The jaguar is largely nocturnal in the areas that are most inhabited by man. At our base on the Río Coatzacoalcos, 20 kilometers east of Jesús Carranza, jaguars were entirely nocturnal. None was seen by day, but tracks from the night before were often seen. It is noteworthy that the Virginia deer, *Odocoileus virginianus*, was common there and probably was the principal source of food, although we found no deer killed by jaguars. This deer is nocturnal.

In the uninhabited jungles to the south, there are no deer. Instead the brocket and peccary are common, and these are diurnal species. In this area we twice saw jaguars in the daytime. The stomach of one jaguar taken in the daytime was empty. Jaguar scats examined along the rivers of southern Veracruz were made up of the hair of collared peccary and one was made up of agouti. One fresh jaguar-kill was found 35 kilometers southeast of Jesús Carranza. It was an adult male brocket, and we judged that it had been killed in the late afternoon of the preceding day. Judging from the sign, the brocket had come to the river on a narrow trail, through an area of sawgrass about 50 yards wide. The jaguar had caught the brocket about 15 feet from the river. Only the abdomen and one flank were torn. The viscera and part of the brisket were eaten. There were no marks on the head, neck or shoulders. The jaguar must have hit the brocket from behind and on one side, killing it with a bite in the chest or abdomen. The skull of the brocket was saved.

It is said that hunters have been mauled, even killed, by jaguars. Jaguars occasionally do considerable damage to livestock, especially cattle. Such damage is usually traceable to an individual jaguar. While we were at our base on the Río Coatzacoalcos, jaguar tracks were seen almost every day in the jungle a mile south of the house. There were more than 100 cattle in the area between the house and the jungle. Yet no livestock was damaged by jaguars there in the several months of our stay that was divided between three different years. Jaguar skins are sold for about 50 pesos, and find a ready market.

One jaguar was examined for ectoparasites, but none was found.

### ***Felis concolor mayensis* Nelson and Goldman**

#### **Mountain Lion**

*Specimens examined*.—Total 4: Catemaco, 2 (U. S. N. M.); 20 km. ENE Jesús Carranza, 200 ft., 2.

**Felis pardalis pardalis** Linnaeus

## Ocelot

*Specimens examined*.—Total 12: Catemaco, 3 (U. S. N. M.); Pérez, 5 (U. S. N. M.); Tierra Blanca, 1; 15 km. SW Jimba, 750 ft., 1; 14 mi. S Acayucan, 1; 20 km. E Jesús Carranza, 300 ft., 1.

*Additional records*.—Mirador (Goldman, 1943:377); Jalapa (Ferrari-Pérez, 1886:128 may be *F. pardalis* or *F. wiedii*).

The ocelot is often termed "tigre" in Veracruz but more correctly is called "tigrillo."

Ocelots are fairly common in the forest and jungles of the tropical parts of the state, but are seldom in evidence. In southern Veracruz they seem to be diurnal and solitary. Never did we shine the eyes of an ocelot when hunting at night. It is suggestive that the only stomach of an ocelot examined contained the remains of an agouti. The agouti, in southern Veracruz, is diurnal. The ocelot mentioned was an adult female. It was not fat, and had a single embryo 37.5 millimeters in length on April 22. It had a few of the common field ticks, called conchuelas.

Our dogs refused to trail ocelots, or other cats. The few specimens obtained were received from native hunters. Ocelot skins had a ready sale, and usually brought about eight pesos.

**Felis wiedii oaxacensis** Nelson and Goldman

## Margay

*Specimen examined*.—Cordoba, 1 (A. M. N. H.).

*Additional record*.—Alvarado, type locality of *Felix mexicana* Saussure (1860:4) that currently is regarded as indistinguishable from *Felis wiedii oaxacensis*. Saussure's name is unavailable for use, being preoccupied by *Felis mexicana* Desmarest 1814.

**Felis yagouaroundi**

## Jaguarundi

This cat is called "onca" throughout Veracruz. On a few occasions we heard it called "tigre" or "tigrillo," but these names are usually restricted to the larger, spotted cats.

We saw but three individuals. At Jimba, 350 feet elevation, one leaped from the cover of dense brush to the center of a railroad embankment, where it paused for a moment, and then leaped to the dense cover on the other side of the tracks. We were unable to shoot it, because a small boy was in the line of fire. On March 16, 1947, 35 kilometers east-northeast of Jesús Carranza a jaguarundi cat made a raid on the chickens at the house in which we were living. Dogs were put on the animal's trail, and although we twice got long-range shots at the animal, when it crossed a meadow, we

failed to get it. The dogs lost it, after trailing it for an hour. On the Río Chalchijapa, southeast of Jesús Carranza, a jaguarundi cat was seen drinking from the river, at the edge of a sand bar. The animal was crouched, and to us, closely resembled a large weasel.

The jaguarundi is a highly specialized cursorial cat. We have discovered from natives that birds form its principal diet. All of our specimens were shot by natives, while the cats were raiding chickens. Usually, after catching a chicken in a quick dash, the cat stops to kill and eat it. There are many ground-living species of birds in the jungles where this cat is found, such as meadowlarks, tinamous of several kinds, quail of two species, currasows, guans, ant thrushes, and numerous others. Skins of jaguarundi cats have little value, and are often offered for sale for a few pesos in shoe stores.

### ***Felis yagouarundi cacomitli* Berlandier**

*Specimens examined*.—Mirador, 2 (U. S. N. M.).

### ***Felis yagouarundi fossata* Mearns**

*Specimens examined*.—Total 6: Río Blanco, 20 km. WNW Piedras Negras, 300 ft., 1; 15 km. SW Jimba, 750 ft., 1; Pérez, 1 (U. S. N. M.); 20 km. ENE Jesús Carranza, 200 ft., 1; 20 km. E Jesús Carranza, 300 ft., 2.

### ***Lynx rufus escuinapae* J. A. Allen**

#### **Bobcat**

*Specimen examined*.—One from 3 km. W Limón, 7500 ft.

The bobcat is called "gato montez" in Veracruz. It is well known on the Perote Desert and in the pine forest area near Las Vigas. Our only specimen was taken on a sandy desert flat, a kilometer in diameter, three kilometers west of Limón, 7500 feet elevation, on September 29, 1948, about two hours after dark. The land is covered by fine, wind-drifted sand that supports some maguey and cactus, and a few scattered juniper trees. There is one large cornfield and several bean fields on the sand flat. The bobcat was probably hunting for mice at the edge of one of the bean fields. The specimen was shot when its eyes were seen in the reflected beam of a hunting light. It is an adult female that was still nursing young. No ectoparasites were noted on it. The specimen was skinned at the town of Perote, where several persons requested the meat.

At Las Vigas we were told that bobcats were fairly common near town. One man brought in an old skin, stuffed with ashes, for sale. The animal was said to have been killed in the lava flow east of Las Vigas the year before.

## Order SIRENIA

## Family Trichechidae

*Trichechus manatus latirostris* (Harlan)

## Manatee

*Specimen examined.*—Alvarado, 1.

Additional records (Ingles, 1959:408, on testimony of natives).—Nautla; Coatzacoalcos; Río Papaloapan.

Manatees are reported at the mouths of the larger rivers in Veracruz. They are not common, and we never saw one alive. Fishermen at Alvarado reported that the manatees were once fairly common in the Bay of Alvarado, but were now scarce. Only about ten were taken in a year at the Port of Alvarado, although no specific hunting for them is carried on. Specimens, especially small individuals, are taken occasionally in fish nets. One fisherman was commissioned to obtain a skull for us, and after some two months, did so. The manatee is known as both "manati" and "malachin" in Veracruz.

## Order PERISSODACTYLA

## Family Tapiridae

*Tapirus bairdii* (Gill)

## Baird's Tapir

*Specimens examined.*—Total 5: Buena Vista, 1 (U. S. N. M.); 20 km. ENE Jesús Carranza, 200 ft., 1; Arroyo Azul, 20 km. E, 8 km. S Jesús Carranza, 1; 32 km. ESE Jesús Carranza, 350 ft., 1; 60 km. SE Jesús Carranza, 450 ft., 1.

The tapir is called "anteburro" over most of Veracruz, though the names "tapir" (Spanish pronunciation) and "elefante" are also, though rarely, used.

Tapirs are still common in southern Veracruz. They are most abundant in the dense jungles on rolling hills and relatively level land, at fairly low elevations. However, they were found in the rough hills, among the limestone cliffs, and even where the jungle was of almost alpine aspect, though still at low elevations. Near human habitations, tapirs become extremely shy. However, they are able to persist even near towns. In one area, where we hunted almost every day and saw tracks of tapirs daily, the local people had rarely seen the animal. One of the best hunters had seen but two tapirs in the area. On one occasion, we found the tracks of a tapir within two kilometers of Jesús Carranza, and from the locality where the tracks were found we could plainly hear the railroad trains and switch engines.



The tapir seems to be both nocturnal and diurnal. Near human habitations it probably feeds at night. On one occasion, while we were hunting from a canoe at night, a large animal was heard moving about in an area of sawgrass near the river. No reflection of eyes could be seen in the beam of our hunting light. A few moments later a rather mournful scream was heard. My native companion imitated the call, though he had never heard it before. A few moments later a large tapir came to the river bank. At close range its eyes had a dull white glow. My companion said that it was calling for its calf, which had probably been eaten by a jaguar. We heard this call repeated through most of the night. This was the only occasion on which we saw a tapir at night.

Although usually found near water, the tapir is found far from water if other conditions are favorable. In the Rincón area, west of Jimba, we saw numerous tapir trails several kilometers from water. Probably these localities have numerous water holes over most of the year, but in the last two months of the dry season, this is not true.

In and along the rivers of the uninhabited areas of extreme southern Veracruz, we saw tapirs almost daily. Most were in the water of the rivers. They were skillful swimmers. Usually they lay with only their heads exposed above the surface, and probably remained motionless in the water for long periods in the heat of the day. When approached, they swam off, with only the head showing above the surface. They swam swiftly and smoothly. If frightened, they dive from sight beneath the surface, as skillfully as a muskrat, and remain beneath the surface for a considerable time. On land, the tapir looks clumsy. The legs seem too close together. The long neck is held upright, and the large head with the trunk all combine to give the animal a surprisingly giraffelike appearance.

The tapir is a powerful animal, as may be determined from its trails. It pushes through sawgrass, brush, vines, and other vegetation like an army tank, giving way only to trees. On one occasion, a tapir was frightened in a small arroyo and fled through the thorny bamboo, called jimba in Veracruz. This plant grows in dense patches, sometimes acres in extent. It is about 12 feet high, and each stalk is about three inches in diameter at the base, and as strong as most bamboo. At each joint there are three or four long, strong, hooked thorns. This plant is almost impenetrable for man, and all other mammals save the tapir. The animal mentioned crashed off through the jimba, tearing a trail through the tough growth as easily as a man might through tall grass. Natives told us that, occasionally,

a tapir in its mad flight from danger, overruns a man and kills him. We were told that a female defending its young will try to trample an enemy.

About noon on May 25, 1948, at a place 32 kilometers east-south-east of Jesús Carranza, we were traveling up the river (Solosuchil) in a dugout when a motionless tapir was seen. It was in the water, about four feet deep, and 10 feet from shore. Only the head and neck were above water. When the canoe was about 20 feet distant, the tapir lunged to its feet. Angel fired a load of buckshot into the middle of its back. I hit it in the shoulder with a .22 slug. It dived completely under water and vanished. About two minutes later it appeared near shore about 50 feet upstream. Chico shot it with a load of buckshot, but it lunged to shore. I shot it in the neck with the .22, and it slumped. A total of 14 buckshot had hit it in the neck and shoulders and back. All had glanced off, after gouging small holes. My first shot had also glanced from the shoulder but entered the mandible, and lodged there. My second shot had entered the spinal column between the third and fourth vertebrae, killing the animal. It might have weighed 500 pounds. We rolled and pried it to shore and high enough for a picture. The animal, a non-pregnant female, had a few *conchuelas* (ticks) on the eyelids and ears, but about 100 large *garrapatas* (ticks) on the breast, abdomen, and medial side of the upper part of each foreleg. The skin of the back, neck and shoulders was more than one half inch thick.

Probably only the jaguar is an enemy of the tapir. We doubt that a jaguar ordinarily could kill a full-grown tapir. One of our hunters told of seeing a large tapir standing in the river, with blood pouring from many deep scratches in its face and neck. This animal was too sick to move, and allowed him to approach within a few feet in his canoe, without moving. When he returned an hour later, the animal was gone. The tapir has little economic value. We never heard of a tapir disturbing crops. The hide is so thick as to be worthless. The flesh is rank and red, resembling horsemeat. It is often eaten, but is considered poor food. Tapirs are often killed by natives, seemingly for no particular reason.

Order ARTIODACTYLA

Family Tayassuidae

*Tayassu tajacu crassus* Merriam

Collared Peccary

*Specimens examined*.—Total 9: Potrero Llano [= Potrero del Llano], 350 ft., 2; 22 km. ESE Jesús Carranza, 300 ft., 2; 32 km. ESE Jesús Carranza, 350

ft., 1; 20 km. SE Jesús Carranza, 200 ft., 1; 25 km. SE Jesús Carranza, 250 ft., 1; 30 km. SSE Jesús Carranza, 300 ft., 2.

Additional record—Pasa Nueva (Allen, 1904:30).

The collared peccary, called "javalin" or "javalina" in Veracruz, usually travels in bands of from five to ten individuals. It is piglike in its actions, rooting about in the leaves, and constantly hunting for food. Fallen fruit from the jungle trees probably furnishes most of its food. Corn from the natives' fields is also eagerly eaten and a band of peccaries can completely ruin a milpa in a few days.

The presence of a band of peccaries can often be detected by the chomping and clicking of the animals' tusks. When frightened they move off at a sharp trot, and their small hoofs make a distinct clicking noise, even on the soft floor of the jungle. When much frightened they make a dash for deep cover with surprising speed. At times they begin a dash with a few leaps of several yards. They are swift runners, and in dense cover can outdistance a pack of dogs in a short time. In one particular coyol palm jungle, where the undercover was thick and thorny, our dogs chased a pack of javalinas almost daily, but we never came up with the animals.

Ordinarily a hunter without dogs comes upon a band of these peccaries unexpectedly. Sometimes he is forewarned by hearing the clicking of tusks, or, if the wind is in the right direction, by the unmistakable strong odor of peccary. If not so warned, and he comes close to the animals, there is a loud snort, and there is a trotting noise as some of the animals flee. Usually, however, one animal is left, standing motionless, and looking like a small black ball on legs, with each hair standing upright. We believe that the females ordinarily run and leave the males on guard, for every one of our specimens of peccaries is a male.

Two of our specimens were taken in brush and vines at the edge of an isolated corn patch. The stomachs of these animals were filled with chunks of corn cobs. No attempt had been made to chew the corn from the cobs. One peccary was taken in a dense clump of wild bananas. The others were taken in deep jungle.

We were surprised that our native companions considered this species of peccary to be a somewhat fossorial animal. They spoke of running peccaries into their holes, and occasionally looked into holes in the ground for peccaries. In the spring of 1949, however, an old boar peccary did run into a large hole in the ground, where it was shot. A few days later one of our assistants, returning from a hunt, called that he had found a peccary's burrow, and to bring machetes. We found him at the edge of a small cut-bank in the

forest, making a series of growling and barking noises. There was a burrow in the bank, about two feet in diameter. The man had been returning to camp, when he had walked over the burrow. The loud clicks from a peccary in the hole below him had given the first evidence of the presence of the animal. Because of sloppy work by the collectors, this animal was allowed to escape from its hole, and it severely wounded a dog before being killed. It was proven, however, that the collared peccary in Veracruz does not only take refuge in a burrow in the ground when in danger, but actually spends some time in the burrow, perhaps sleeping there.

Our specimens from southern Veracruz were almost covered with ticks. On some individuals there were hundreds, large, medium and small. The fewest ticks recorded from any specimen numbered 50. The collared peccary has a strong musky odor, emanating from a large gland along the mid-dorsal line of the rump, immediately under the skin. The musk gland of one individual measured 75 millimeters long by 35 millimeters wide. The flesh of some animals is so strongly saturated with this odor as to be scarcely edible, but if care is used in skinning the animal little or no musky odor can be detected on the flesh. We found the flesh to be porklike, and never fat. The flesh of the peccary is in demand for food in the native villages and sells for about three pesos per kilogram. On the hides the bristlemarks are distinct and the leather makes a good grade of pigskin. Large skins bring the native hunters about three pesos each.

### **Tayassu pecari ringens Merriam**

#### **White-lipped Peccary**

*Specimens examined.*—Total 7: 20 km. ENE Jesús Carranza, 3; 20 km. E Jesús Carranza, 300 ft., 1; Arroyo Saoso, 37 km. E, 3 km. S Jesús Carranza, 3.

The white-lipped peccary is called "marina" in Veracruz. It is found only in the extreme southern parts of the state: The Tuxtla Mountains, the Rincón area, and the Isthmus of Tehuantepec.

Our specimens of this species were all obtained from native hunters, after we offered suitable rewards for specimens. On several occasions we followed small bands of this species in the jungle, but failed to come up with them.

The white-lipped peccary is more social than the collared peccary. Bands of 50 or more animals were reported to us, but the largest band followed by us, to judge from the tracks, numbered about 25. The smallest band followed numbered about 12. We were told that the odor of this species is like the odor of the collared species, and



that white-lipped peccaries chomp and click their tusks in the same way and call like pigs, though what this call might be, we do not know. Hunters often bag a number of animals from a band; on one occasion about eight were obtained. These animals seem to be rather local in their distribution, abundant in some relatively small areas, and absent over great areas of seemingly similar habitat. They are dangerous when wounded, and in the Río Coatzacoalcos area, hunters have been killed by them.

#### Family Cervidae

### *Odocoileus virginianus*

#### White-tailed Deer

According to the Rules of Zoological Nomenclature, *Dama* Zimmermann 1780 is the correct generic name but the International Commission on Zoological Nomenclature recommends (Opinion 581 of September 16, 1960) the use of *Odocoileus*.

The whitetail is called "venado" throughout Veracruz. It is much hunted, but is still fairly common in some places. In areas where the human population is dense, it has been completely exterminated, for example on the coastal plain near Veracruz.

The habits of this species are much like those of the whitetail of the United States, but modified somewhat to the tropical habitat. It is not found in the jungle or deep forest, but lives in the brush and thickets of the coastal plain, and near the flood plains of rivers in the southern part of the state. We studied and collected deer on the Río Coatzacoalcos, east of Jesús Carranza. Except at one locality, the deer were confined to the large areas of grassland, called sacatales, on the flood plains of the big river. Farther up the river, and on tributary rivers, where the jungle came down to the banks, there were no deer. We were told, however, that deer did occur at the mouth of one arroyo on the Río Solosuchil, called Arroyo de Zouza. Many persons had seen their tracks, but none of the jungle people had ever seen a deer there. We stopped at the mouth of this arroyo, which has a broad, marshy delta and a deep, thicket-filled valley, and found the unmistakable tracks of a large whitetail buck. Seemingly there is a small colony of deer at this locality, isolated by a large extent of jungle.

Along the Río Coatzacoalcos, the whitetail is nocturnal. A few were seen in the early mornings, or late afternoons, on dark, rainy days. Ordinarily they spend the day in dense thickets of wild



bananas or in the dense coyol palm jungle at the edge of the grass fields. They are usually solitary, although on occasions we saw two, three or four together.

Over most of Veracruz, this deer is hunted with dogs in the daytime or with hunting lights at night. The whitetail is said to be preyed upon by the jaguar. Specimens taken by us were heavily parasitized by ticks. The antlers of a specimen taken in March, and another taken in April, were in the velvet stage.

In 1948 in manuscript Dalquest summarized results of his study of available specimens as follows: "Goldman and Kellogg (1940:89) described a subspecies of deer from northern Veracruz as new, under the name [*O. v.*] *veracruzis*. They stated that this subspecies intergraded with the subspecies [*O. v.*] *thomasi* to the south. In the same paper they mention that the deer of the Isthmus of Tehuantepec are [*O. v.*] *thomasi*. Although no ranges or lists of specimens examined are included in the paper, it would seem that the authors would restrict the name *toltecus* to [deer of] the high parts of central Veracruz, and perhaps to the area farther westward.

"The type locality of [*O. v.*] *toltecus* is in the tropics, at Orizaba. Specimens, presumably of *toltecus*, have been examined from Mirador, Veracruz. I can see no essential differences between them and the specimens from Chijol, the type locality of *veracruzis*. On geographic grounds I would not expect any difference between the two.

"Specimens from extreme southern Veracruz are smaller and more reddish thus agreeing with *thomasi*. They agree with specimens from the coastal plain of Veracruz. In this area I examined numerous skins of deer taken by hunters from the coastal plain as well as from the Isthmus area. Variation in color is great, although the average is rather bright red. Deer from both areas are small.

"In the Tuxtla Mountains I saw whitetails that were much larger than any deer observed on the coastal plain or the Isthmus.

"Possibly five minor geographic variants ought to be recognized in Veracruz, although specimens supporting such an arrangement are not available. The variants would be from northern Veracruz (*veracruzis*), the uplands of central Veracruz (*toltecus*), the coastal plains (unnamed variant), the Tuxtla Mountains (unnamed variant) and the Isthmus of Tehuantepec (*thomasi*).

"The recognition of any of them, on the basis of the scanty material available, and considering the individual variation to be found in this species, seems hazardous."

### ***Odocoileus virginianus thomasi* Merriam**

Record.—Catemaco (Miller and Kellogg, 1955:807).

### ***Odocoileus virginianus toltecus* (Saussure)**

*Specimens examined*.—Total 13: Mirador, 4 (U. S. N. M.); Buena Vista, 4 (U. S. N. M.); 35 km. ENE Jesús Carranza, 150 ft., 1; 20 km. ENE Jesús Carranza, 200 ft., 3; 20 km. E Jesús Carranza, 300 ft., 1.

*Additional records*.—Near Orizaba (Saussure, 1860:247); Pasa Nueva (J. A. Allen, 1904:30).

***Odocoileus virginianus veraecrucis* Goldman and Kellogg**

*Specimens examined*.—Total 3: Chijol, 2 (U. S. N. M.); Potrero Llano [= Potrero del Llano], 350 ft., 1.

Additional record.—Near port of Veracruz (Miller and Kellogg, 1955:806).

***Mazama americana temama* (Kerr)****Red Brocket**

*Specimens examined*.—Total 13: Potrero Llano [= Potrero del Llano], 350 ft., 1; 3 km. SW San Marcos, 200 ft., 1; Mirador, 5 (U. S. N. M.); Catemaco, 2 (U. S. N. M.); Arroyo Saoso, 37 km. E, 7 km. S Jesús Carranza, 2; 35 km. SE Jesús Carranza, 400 ft., 1; 30 km. SSE Jesús Carranza, 300 ft., 1.

The brocket is called "temazate" in Veracruz. Seemingly it is never confused with the whitetail, or "venado." The brocket lives in the deep forest and jungle. It is shy, and quick to sneak away at the least alarm. Often it moves off a short distance and stands motionless, invisible in the gloom and reddish shades of the jungle floor. When chased by dogs it runs to dense thickets in the arroyos, where it winds about until the dogs are exhausted and give up the chase.

Broackets seem to have small individual ranges. Those chased by our dogs usually circled about in an area of a kilometer or so in diameter. Broackets are principally diurnal. One was seen at night, but the others seen by us were active in the daytime. Several were seen as they came to drink at the edges of rivers. One of these was at a level sand bar, but three or four others had chosen steeply sloping banks.

In the hills of central Veracruz, the brocket is still to be found, although it is scarce because of excessive hunting. At Mirador, the type locality of *Mazama sartorii* (now arranged as a synonym of *M. a. temama*), the brocket seems to have been extirpated. Mr. Walter Sartorius showed us a collection of antlers of deer and brocket from the area around Mirador but said that no brocket had been seen there for many years. It was the grandfather of Walter Sartorius after whom the species *Mazama sartorii* was named in 1860 by Saussure. In northern Veracruz, the brocket was said to be common in deep jungles, but we did not investigate. One skin was sold to us by a native hunter. In extreme southern Veracruz, the brocket is abundant.

Broackets are solitary animals. We never saw more than one at a time, nor did we see tracks of more than one animal in a place. One of the strangest things about this species is the scarcity of females. All of our specimens are males and we saw no females

in Veracruz. Of the seven specimens in the United States National Museum from Veracruz, one is a female, and it is very young. Native hunters told us that females were rare.

Concerning a specimen taken three kilometers southwest of San Marcos in central Veracruz, on November 1, 1947, I wrote in my field notes as follows: "While walking along the bed of an arroyo today, in deep jungle, I heard a rock roll on the hillside above me. The slope was about 30°, and the hill was surprisingly open. The ground had seemingly recently slid, and since become covered with a dense mat of morning-glorylike vine. A male brocket was feeding on the hill. . . . The specimen was fat and in perfect health. The coat is fine, and deep, rich red in color. The horns are small, but sharp and gnarled. Its testes measured 38 mm. in length. It had no ectoparasites that we could find. The hoof-glands were of a dark olive-brown color. . . . I estimated its weight at 35 pounds."

An adult male shot in a dense tangle of wild banana and thorny bamboo in southern Veracruz was older than the specimen taken near San Marcos and had numerous small and medium-sized ticks, as well as hundreds of deer lice.

Flesh of the brocket tastes much like that of the whitetail and perhaps is even superior. It brings a good price in the native villages. The skins are too small and thin to provide good leather, and so have no commercial value, although a few are sold as trophies. Because brockets live in the deep forest and jungles, they do not come into contact with the crops of the natives. One brocket that had been killed by a jaguar was found (see account of the jaguar).

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*Transmitted June 21, 1962.*